RAILROAD GAZETTE

FRIDAY, JANUARY 5, 1877.

Handyside's Steep Gradient Locomotive.

The plan of working steep gradients which has been proposed by Mr. Henry Handyside, of Bristol, England, has recently been put to a practical test, and was described in *Engineering* of Oct. 13, to which we are indebted for the description and also for the engravings:

The working of steep gradients on mountain and other railways is a matter which has of late years attracted very considerable attention both in this country and the Continent, and a large number of schemes—some of them of a very visionary character—have been brought forward as solutions of the problem. Of these plans comparatively few have reached the test of practical working, but among those which have been thus tested is one of which we propose now to have something to say. The system of working to which we refer is that of Mr. Henry Handyside, which has already been several times mentioned in our pages, and the working of which we last week had an opportunity of examining on the Hopton incline of the Cromford & High Peak Railway. Mr. Handyside's system of working, which is now being introduced by the Handyside Steep Gradient Company, is probably known to a large number of our readers, yet it may be desirable that we should describe it briefly here. The system consists in fitting a locomotive with a winding drum and a suitable length of wire rope, and then employing it alternately as an ordinary locomotive and a winding engine. Thus, supposing the engine to have arrived at the foot of an incline with its train, it is unhooked from the latter, the hauling rope is attached to the foremost vehicle, and the engine proceeds up the gradient paying out the rope behind it, the train of course remaining at the bottom. The rope having been all paid out, the engine is stopped and "anchored" by means of a powerful brake arrangement, which we shall describe presently, and the winding gear being put in motion, the engine hauls up its train, or a portion of it, as the case may be. When the train or portion thus hauled up has reached the engine, it is in its turn "anchored," and the engine proceeds up the gradient for another distance equal to the length of rope available, when it is again anchored and the winding recommenced, these processes being repeated until the top of the incline is reached. For retaining the train or portion of a train in position on the incline during the intervals when the engine is running forward and paying out the rope, Mr. Handyside has devised an arrangement of automatically-acting gripping struts, which are to be fitted to the last wagon or guard's van; but on most existing inclines the wagons can be safely held by their own brakes, although the automatic strut is of course more convement.

The Hopton incline, on the Cromford & High Peak line, near Wirksworth, is now being worked by the second locomotive which has been constructed on Mr. Handyside's system. This locomotive, of which we give an elevation on page 321, is a six-wheeled tank engine with all the wheels coupled and fitted with the winding gear, already mentioned, at the trailing end. The engine, which was built by Messrs. Fox, Walker & Co., of Bristol, for the Handyside Steep Gradient Company, has 13 in. cylinders with 20 in. stroke, and the wheels are 3 ft. 6 in. in diameter, while the wheel-base is 9 ft. 8¼ in. The winding drum is situated between the frames at the hind end, the rope being paid off from the upper side of the drum, so that, as far as possible, it is kept clear of the ground. Light wooden rollers are, however, provided at intervals between the rails to carry the rope, which is 300 yards long and made of steel wire. The winding drum is driven by a pair of vertical engines with 10 in. cylinders and 9 in. stroke, these engines acting through a compact arrangement of epicycloidal gearing, the arrangement being such that the rope can be paid out without the winding engines being run. The engine has 67 square feet of fire-box surface, and 481 square feet of tube surface, the boiler containing 125 tubes 1¾ in. in diameter by 8 ft. 5½ in. long. The total heating surface is thus 548 square feet, while the grate surface is 6.9 square feet. Water is carried in a saddle tank containing 450 gallons, and coal in bunkers having a capacity of 10 cwt. The water supply is found sufficient for two hours of the hardest work. The engine weighs in average working order about 22 tons.

On each side of the engine between the leading and driving wheels is fitted Mr. Handyside's brake, already mentioned. In the case of the locomotive we are describing this brake is applied by means of a steam cylinder, the piston of this cylinder being coupled to an arm on a rocking shaft, and this rocking shaft having arms from which the brake is worked, as shown. The construction of the brake itself will be best understood by reference to the detail view, Fig. 2, on page 321, which also shows the section of the rails which have been laid down on the Hopton incline to enable the system to be fairly tested. As shown by the sketch, the brake has three gripping surfaces, the one being brought into contact with the top of the rail, and the two others gripping the sides. From the construction of the arrangement it follows that when the brake is applied the top brake piece first closes down upon the top table of the rail and then forms a fulcrum for the fingers or gripping levers through which the side pieces are applied. The three gripping faces are of malleable iron, and are so fixed as to be readily renewable when required.

As we have already said, the brake just described serves to anchor the locomotive when it is acting as a winding engine; but it is also used when necessary during the descent as a safety brake to keep the train completely under control. Of course on gradients even as steep as 1 in 12, a train can, if all its vehicles be fitted with brakes, be kept under control by these brakes except in very bad weather. There are, however, times when the rails are so greasy that the ordinary brakes could not be relied upon to arrest the train, in the event of its being allowed to get up too much speed when running down the incline, and in such cases the Handyside brake does good service. In fact at the Hopton incline it would without it be extremely difficult, if not impossible to control the loads brought down.

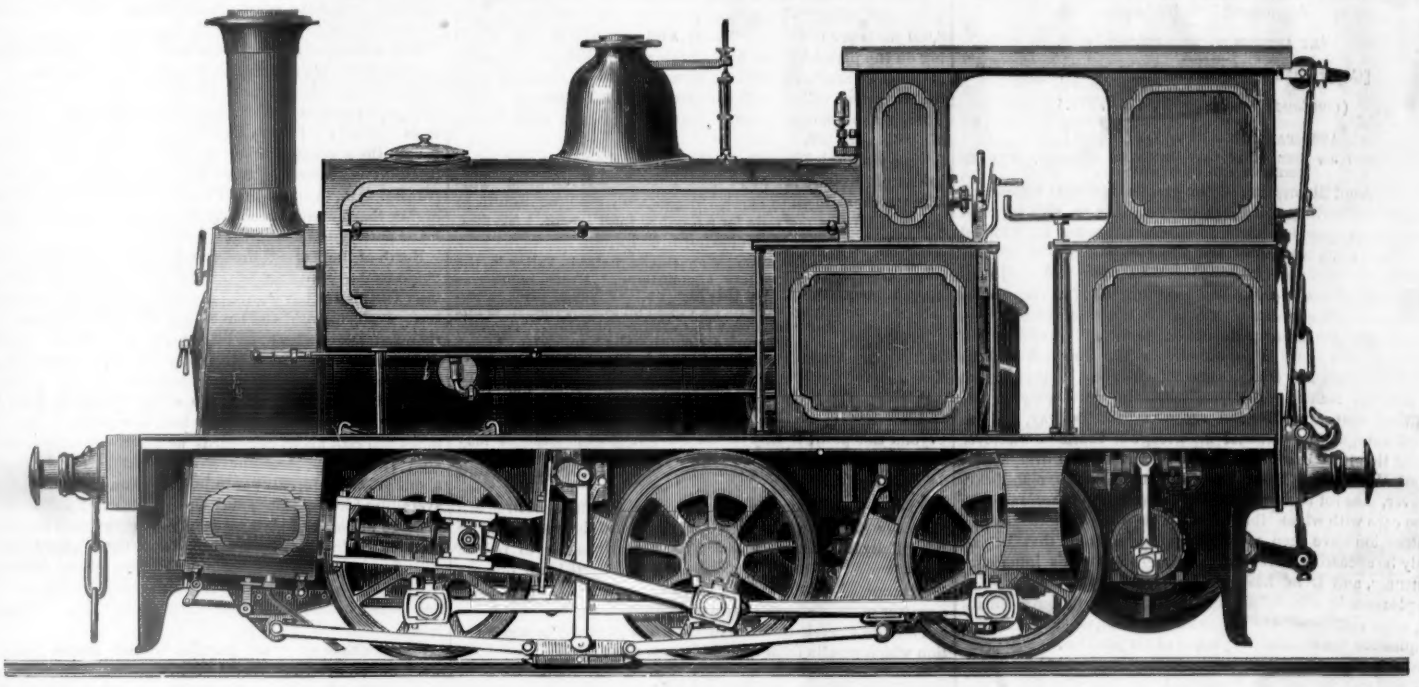
The Hopton incline is a quarter of a mile in length, and has a gradient of 1 in 14, while it is straight throughout. Ordinarily the traffic of the London & Northwestern Railway Company over it is worked by a stationary winding engine, but it has now for some weeks been conducted by Mr. Handyside's locomotive, which we have been describing. The engine picks up the up trains at the head of the Middleton incline (a gradient which is also worked by a rope and winding engine), does what shunting may be needed there, then proceeds with its load to the foot of the Hopton incline—doing shunting when required at some quarry sidings *en route*—and finally ascends the Hopton incline, delivering up its load at the top of the gradient, and receiving in turn any down loads which may have arrived.

The day on which we had an opportunity of examining the working of the engine was one especially unfavorable to the performance of an ordinary locomotive, there being an almost constant drizzling rain and the rails being in a very greasy condition. The first load delivered to the engine was a light one, it consisting of one wagon of coal and two empties, weighing in all 20 tons. This light train was of course taken up without being divided, the incline being traversed in two lifts and the times occupied in the different operations being as shown in the table in the next column.

The total time occupied in taking up the load was thus 7 min. 35 sec., of which 4 min. 45 sec. were occupied in actual hauling. The hauling was thus performed at the rate of about three miles per hour, while the whole operation of lifting, including all stops, was at the rate of about two miles per hour. During the operation the whole of the arrangements acted perfectly, without a hitch of any kind.

Before starting with a down load some experiments were made with the engine alone to test the holding power of the steam brake. For this purpose the engine was started from the top of the incline and allowed to run down freely to a given point at which the brake was applied. The speed acquired by the engine was ascertained by measuring by means of a chronoscope the time occupied in passing over the last 18 yards prior to the application of the brake. In the first experiment in which this observation was made, the time occupied in traversing the distance just mentioned was 3.25 seconds, the speed being thus $\frac{18 \times 3}{3.25} = 16.6$ ft. per second, or 11.29 miles per hour. From this speed a stop was made in a distance of 16 yards. The second experiment was simply confirmatory of the first, the 18 yards being run in 3¼ seconds, giving a speed of 16.8 ft. per second, and the stop being made in a little under 17 yards. The mean resistance opposed by the brake during the stops can easily be calculated from the above data. Taking for instance the first experiment, the engine had at the moment of application of the brake acquired a speed of 16.6 ft. per second, or that which would be attained in falling from a height of $\frac{16.6^2}{64.4} = 4.28$ ft. Moreover, the gradient being 1 in 14 and the distance run in making the stop being 16 yards or 48 ft., the engine would, during the time the stop was being made, fall a further distance of $\frac{48}{14} = 3.43$ ft., and the total energy destroyed by the brake was thus that which the engine would have acquired in falling through 4.28+3.43=7.71 ft. But the distance traversed by the engine after the brake was applied was as we have said 48 ft., and the mean resistance thus exerted must have been $\frac{7.71}{48} = 0.16$, or 16 per cent. of the weight of engine. Taking this weight as 22 tons, the mean resistance must thus have been 22×0.16=3.52 tons. This is, as we have said, the mean resistance, but it must be remembered that this resistance had to increase from *nil* to its maximum during the brief period when the engine was traversing the 16 yards, and we shall probably not err greatly if we estimate the maximum resistance at fully double the mean, or say about 7 tons. That the brake is capable of exerting fully as great a retarding power as this appears to us fairly proved by subsequent experience in bringing down a heavy train, a matter of which we shall speak presently. Of course, the application of a brake in the manner we have described throws a heavy strain on the rails; but it is only fair to Mr. Handyside to say that his permanent way shows no signs whatever of disturbance, although the sleepers are only laid on the ballast and not bedded in it. This result is, no doubt, largely due to the fact that the brake is so situated that the part of the rail on which it acts is at the time bearing a large proportion of the weight of the engine, the adhesion between rail and sleeper due to this weight aiding materially in keeping all right. It must also be borne in mind that in the ordinary working of the incline the brake is, as a rule, only applied when the train is moving at a slow speed, the brake preventing anything like running away.

	Times from start. m. s.	Difference or times of each operation. m. s.
Engine started from foot of incline	0 0	
" stopped and "anchored"	0 55	0 55
" commenced hauling up load	1 25	0 30
" finished hauling	4 00	2 35
" again started up incline	4 25	0 25
" stopped and anchored at top	5 13	0 48
" commenced hauling up load	5 25	0 12
Load arrived at top of gradient	7 35	2 10



HANDYSIDE'S STEEP GRADIENT LOCOMOTIVE.

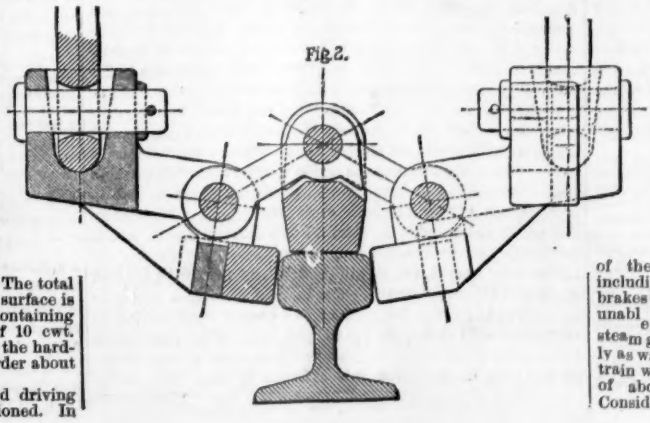


Fig. 2.

After the brake trials, of which we have been speaking, the engine successfully took down the incline a load cosisting of a van and ten trucks, of which six were well loaded, the total weight of the incline train, exclusive of the engine being 75 tons, or including the engine, 97 tons. The van and ordinary engine brakes were applied during the descent, but these alone were unable to keep the train under control. By the aid of the steam gripping brake, however, the descent was made as slowly as was desired, while several times during the descent the train was almost instantly brought to a stand from a speed of about 6 miles per hour by applying this brake fully. Considering the state of the rails this was a very severe test,

The second load taken up consisted of one 8-ton and one 10-ton coal wagon, both loaded, and one wagon containing grains, the total load, exclusive of the engine, being 37½ tons. This train was also taken up as one load, the times occupied being as follows:

	Times from Start. m. s.	Differences or Times of each Operation. m. s.
Engine started from foot of incline	0 00	1 20
" stopped and "anchored"	1 20	0 15
" commenced hauling up load	1 35	2 50
" finished hauling	4 25	0 12
" again started up incline	4 37	1 00
" stopped and anchored at top	5 37	0 04
" commenced hauling up load	5 41	2 14
Load arrived at top of incline	7 55	

In this journey some seconds were lost from there being a thick mist at the top of the gradient where some men were at work, and the engine being thus obliged to approach the summit slowly. The operations, however, were performed as easily and as steadily as with the first load, and in fact the second load was considerably under that which the engine frequently takes up in ordinary work. On the day of our visit, however, the up traffic being light, a heavier train was not available.

Contributions.

The Justifiable Expenditure for Improvement in the Alignment of Railways.

BY ARTHUR M. WELLINGTON, C. E.

[Copyright 1876, by the Railroad Gazette.]

(*Continued from page 566, Vol. VIII.*)

ASSISTANT ENGINES (CONTINUED.)

THE LOCATION OF THE CINCINNATI SOUTHERN RAILWAY, BETWEEN SOMERSET AND CHATTANOOGA.

As a second illustration of the great advantages which may often be realized by using assistant engines on well adjusted grades, we propose to make a comparison between the adopted line of the southern half of the Cincinnati Southern Railway between Somerset and Chattanooga 177.4 miles and a rejected route which passes over the highest summit and has nominally the highest ruling grades of any one of the 26 different routes given in the "Preliminary Report on Surveys." In the view of the writer, this route is not only by far the cheapest of them all to build, but it is also by far the cheapest of them all to operate. In reaching this conclusion he relies only on the published maps, profiles and reports of the railway, and has the advantage of no personal knowledge of the facts whatever beyond this if we except that given by a short trip over a portion of the present line. The Cincinnati Southern Railway, however, has set such an excellent example to other railways in the care with which the fullest details of its location and construction have been recorded and preserved, that he can hardly be accused of evolving a location out of his inner consciousness, and if he has erred in any detail he will take sincere pleasure in acknowledging and correcting it; but he fears that, after making all allowance for any such, no candid reader will question the substantial justice of his position.

He will only add further that he has no manner of knowledge as to who may be mainly responsible for the adoption of the present line and feels the greatest unwillingness to reflect upon the work of any one, but he feels bound to use so forcible an illustration of the principles which he has endeavored to inculcate in the interest of professional knowledge.

The present line of the Cincinnati Southern Railway, as may be seen on the accompanying map, crosses the Tennessee River immediately out of Chattanooga, and follows up its valley to Emory Gap, 76 miles. On most of this distance the work is comparatively light and the ruling grades are 40 feet per mile, increased by 4° curves. From Emory Gap to Somerset, Ky., 101 miles, the line follows defiles or ridges of the Cumberland Mountains and is throughout of the most difficult and costly character. It is, beyond doubt, the heaviest consecutive 100 miles of railway in the United States, and the ruling grades on it are 60 feet per mile each way, increased by 6° curves. An outline sketch of the profile of this line is shown in Profile 4.

The line which we propose to compare with this is known as the "Sequatchie Valley line" and is shown on the accompanying map by the heavy dotted line. The elevations over this line and the grades which we have assumed for it are shown in Profile 5. A glance at this profile will show that the line is characterized by low grades over the greater portion of the line, with very heavy gradients at a few points for short distances. We will therefore assume for the purpose of adjusting gradients that the most economical motive power would be light through engines with say 20 tons on drivers, and heavy "Consolidation" pushers, of say double this weight on drivers, for working the inclines. Such through engines would haul in every day practice, by Table XVII., page 442, 20.76 cars of 20 tons each. We will now describe this line in the words of the "Preliminary Report," beginning at Chattanooga.

The first 16 miles, to the crossing of the Tennessee River, is described as follows:

"Leaving Sequatchie Valley, the line follows up the Tennessee River 6 miles, and ascending its slopes, crosses the Raccoon Mountain. A grade of 80 feet per mile is required on each side with a tunnel of 1,550 feet at the summit. The work is moderate across this mountain, but heavy for a mile along the Tennessee River toward Chattanooga, already occupied by one road and rather narrow for another. The line then follows this road to Chattanooga."

On this 16 miles a grade of 20 feet per mile is easily obtained, except at the crossing of the Raccoon Mountain, over a summit of about 240 feet. On this crossing Table K will show that a grade of 92 feet per mile worked with the pusher described is the equivalent of 20 feet. We will therefore use 92 feet per mile instead of 80 feet, lighten the work and avoid the tunnel.

We may assume that this section, with these grades over the summit, and exclusive of the Tennessee River bridge, will not cost more than $20,000 per mile, the average of the second heaviest 40 miles of the line, exclusive of bridges and masonry. We then "cross the Tennessee River at the Narrows," and are in the Sequatchie valley, which is thus described:

"The Sequatchie Valley is a straight, deep, trough-like valley about 160 miles long, bounded by the abrupt escarpment of the table-land on each side, 800 to 1,500 feet high, and is from three to six miles in width. It affords a very level, smooth route for a railway. * * When once in it the line becomes very smooth and level, with the lightest kind of surface work the whole length of the valley (46 miles from the Tennessee River crossing). A few lateral streams cross the line, but small embankments and bridges will raise it above them. The Sequatchie River requires a bridge 150 feet in length.

"The valley is well settled, and said to contain iron ore in great abundance. Coal is also abundant on both sides of the valley, and the timber is abundant and good. An extension of a few miles would give a direct connection with the Memphis & Charleston Railroad, saving about 30 miles of haul on all business from the southwest."

From the report of the Nashville & Chattanooga Railroad for the present year we learn that such an extension is now being made by that road to reach the rich mineral deposits of this valley, and that outcroppings of bituminous coal in veins of 7 to 10 feet, and of hematite iron ore in veins of 4 to 8 feet, are found in close proximity. Those familiar with mining will appreciate the extraordinary character of such deposits, but in this much-favored region it may be equaled on the other side of the mountain, along the adopted line.

The average fall of this valley is under five per mile, but we will assume that 20-feet grades each way will be required, with 8,000 yards per mile of earthwork, and only half of the bridging on the parallel Division G of the present line, as the valley is evidently much smoother and less cut up by streams than the Tennessee valley on the other side of the mountain. This would make the cost of grading and bridges per mile $2,650. We will say $3,000.

Thus we reach Pikeville, at the head of the valley, and begin the ascent to the Plateau of the Cumberland Mountains. This ascent was made on the preliminary survey with an unbroken grade of 111 feet per mile for 9.6 miles; total ascent, 1,066 feet. Of the line we have the following description:

"The work on the ascent from the Sequatchie Valley is the heaviest we have anywhere encountered. Every effort was made to make the best of this line, but the face of the mountain is so broken up with rocks, cliffs and gorges that it is difficult to get a line which may be called practicable. Tunnels, trestles and heavy cliff work are continually required. * * Daddy's Creek runs very close to the head of the Sequatchie Valley, and by commencing about the high-water mark of this stream and tunneling into the head of the valley, and then tunneling a tongue of land called Brown's Gap, and then crossing four very large and deep gorges, with similar work beyond this point to that on the other route, the descent may be made with a grade of 105 feet for seven miles and easier grades for the rest of the descent, the total fall being about 900 feet."

Now this is discouraging enough, but careful reading will show that all this costly work is encountered in seeking after two wholly unnecessary ends. The first of these is to reduce the rate of ascent to the *lowest possible limit;* but if we operate the incline with assistant engines the rate of ascent is wholly a matter of indifference within wide limits*, and we could not ask a more forcible instance of the great economy in construction which results from their judicious use.

TABLE XXIV.

Showing the engine ton-mileage required to move one ton of net load 100 miles on a level, except for a rise of 2,400 feet on different grades, worked with assistant engines. According to the average daily experience of American Railways, as determined from Table XVII.

Rate of grade on incline. Ft. p'r mile	Length of incline. Miles.	Length of level track. Miles.	Engine ton-mileage per ton of net load moved 100 miles. While on incline.	While on level track.	Total.
24	100	0	1.056	0.0	1.056
30	60	40	0.862	0.210	1.072
80	30	70	0.760	0.369	1.129
100	24	76	0.755	0.400	1.155
120	20	80	0.766	0.421	1.187
150	16	84	0.803	0.442	1.245
200	12	88	0.900	0.463	1.363

It will be seen that the rate of incline has an inconsiderable influence on the motive power required, and the thoughtful reader will perceive why this should be so and yet that high ruling grades, for through engines, should be a very costly luxury. If we keep two "Consolidation" pushers at work on this incline, the motive power is increased five times, and the grade corresponding to 20 feet for one engine will then (by Table XVII.) be 145 feet per mile, and this grade is in no appreciable respect more costly or objectionable than a grade of 92 feet per mile, worked by one pusher.

The second unnecessary end referred to lay in the attempt to make the whole surface of the earth fit a 6° curve. Now we certainly have no right to introduce sharper curvature on one line than the other, *under the same circumstances*, and then compare the two, however much we might question the propriety of the standard adopted; but we *have* a right to assume that if this survey had been conducted with reference to the possibility of properly adapting the line to assistant power (as it evidently was not), the locating engineer would have investigated the subject, as we shall do in the following paper, and discovered—if it was not already known to him—that 10° curves were no more objectionable to trains worked with such pushers than 6° curves to the same train with only one engine. This is more especially true if in both cases the grades were heavily and amply reduced for curvature, but it is very nearly true if neither is. On the present line the maximum grade was not reduced on curves, but it will be evident that with 142 feet grade and 10° curves on this short incline, we might easily do this and at the same time reduce the cost of construction to very reasonable limits, say $40,000 per mile. The heaviest 40 miles of the present line, very heavy throughout, averaged $60,000 per mile, but we think this estimate is fair. The reader has all the facts before him which the writer has, and can judge for himself.

We are now on the PLATEAU OF THE CUMBERLAND MOUNTAINS, on the highest point touched by 1,500 miles of surveys for 26 different routes, viz., 2,000 feet above the sea, and 500 feet higher than the highest point of the present line. This plateau is a peculiar topographical feature, and is thus described:

"It is a vast plateau (about 25 miles wide by 80 miles long) elevated above the adjacent country on either side by from 500 to 1,200 feet. While maintaining in general the character of a table-land, it has large regions cut up by deep drainage, and other spaces on which rise great masses of mountains still more elevated. These two latter classes of plateau are almost entirely impracticable for railway purposes, but in other parts the table-land affords good routes for considerable distances. The ridges between the streams are often quite level, and the upper part of the streams are flat until they begin to cut through the heavy sandstones which form high cliffs along the larger streams and bound the spurs of the entire mountain. The entire mountain is a coal field, the stratification being nearly horizontal."

On this plateau we follow the dividing ridge to Jamestown, 52 miles. Of the last 18 miles of this distance we are told:

"The plateau is smooth, and the line down the divide is straight and level, with light work."

Of the remaining 34 miles of this distance:

"The line actually run (to pass off from the plateau to the southeast through Crab Orchard Gap) was not favorable. * * * This can, however, be avoided by following the main divide south of Bledsoe's Stand, which would take the line four miles west of Crossville, and make the distance from Bledsoe's to the head of the Sequatchie Valley, 32.9 miles. This would probably make the route similar to the light ridge work between Bledsoe's and Jamestown."

This is the line shown on the map and in Profile 5, and we assume from this description that 20 feet grades may be easily obtained on this distance with 15,000 yards of earthwork per mile, and possibly one or two trestles, but with no bridges or even culverts of any importance. At 15 cents per yard (about the average price on the present line) this gives $2,250 per mile to subgrade, but we will say $3,000. We are here parallel with, about 25 miles west of and from 500 to 1,000 feet higher than, what is probably the costliest line (measured by labor performed) in the United States.

North of Jamestown the line follows a narrower dividing ridge to the State line, 18¼ miles by survey, 12 miles in an air line. Of this stretch we are only told that it has "considerable heavy rock cutting," and nothing is said about grades. We will therefore assume that on this stretch and thence northward down the Cumberland Mountain (24 miles) we shall be obliged to use a 20-ton assistant engine and use the corresponding gradient (by Table K), 59 feet per mile. With these grades it would appear to be a fair estimate that this 18 miles will cost about two-thirds as much per mile as the parallel Division E, less the cost of bridging and tunnels, or about $16,000 ($15,700) per mile. Division E has nine tunnels averaging 820 feet long, and the above sums sufficient at the average prices for 20,000 yards of rock excavation per mile.

At the State line we descend from the plateau (760 feet) with "a grade of 80 feet per mile for nine miles. The work is extremely heavy, embracing several tunnels and high trestles, and a large amount of rock excavation. The alignment is fair."

Here we have an exact parallel to the ascent before considered, and need not go over the ground again. With one heavy pusher in addition to the 20-ton assistant from Jamestown, we have four times the usual motive power on the 20-feet through grades. The equivalent grade is 120 feet per mile, the equivalent curve is 8° or 9° at least, and with them we can shorten the descent at least one mile, and probably decrease the cost per mile to about two-thirds of the average cost of Division E, including tunnels, bridges and masonry, or about $30,000 per mile. In evidence of this we may add that seven and a half per cent. of Division E is through tunnels or on viaducts.

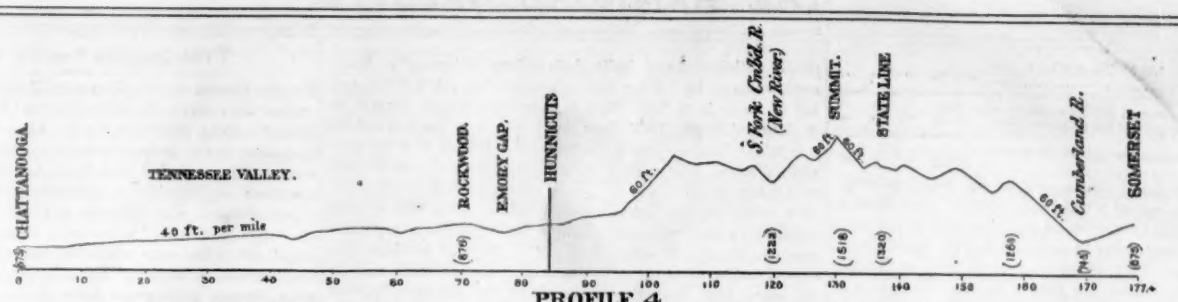
From the foot of the Cumberland Mountains we pass, without difficulty, to Monticello, nine miles distant by survey, and on the same elevation. We increase this distance, however, two miles, in order to avoid a tunnel through a spur of the mountain and reduce grades to 20 feet. As there are no streams to cross, and we are told that on the preliminary line "the work is light, with fair alignment," and the region around Monticello is described as a "smooth table land," the possibility of doing so would seem to be a fair assumption, if we allow 40,000 yards of earth-work per mile, or its equivalent in other work, which would make the cost $6,000 per mile.

At Monticello we are obliged to abandon the natural continuation of the Sequatchie line northward (shown on the map by the light dotted line), in order to connect with the present line at Somerset for comparative purposes. In order to do this we will piece out our line with a section from another abandoned line, which runs northeasterly from Monticello, and crossing the adopted line near Somerset, continues on to the eastward. This section is described as follows:

"The distance from Somerset to Monticello is 24 miles. The heavy work on this distance is confined to seven miles of 76-feet grades on the cliffs of the Cumberland and the bridge over that stream [described as 800 feet long and 90 feet high as against 1,200 feet long and 150 feet high by the adopted line]. On the remainder of the distance the work is very light, the grades easy and the alignment good. It is an old-settled limestone table-land and has some fine-looking farms. The edge of the coal field lies just east of the line, and good coal can be procured by short branch lines. Iron ore is also found here and was worked to some extent some years ago."

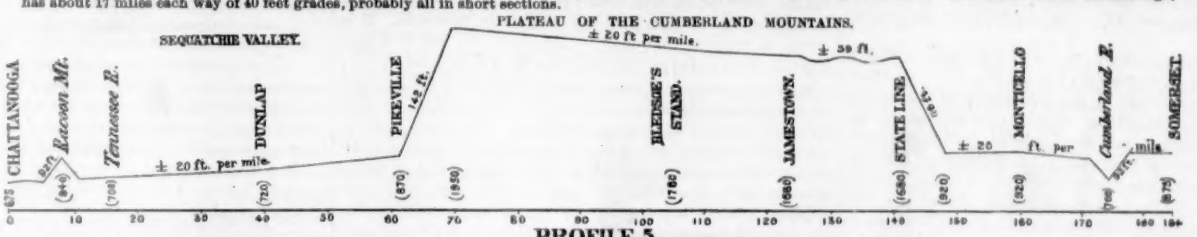
It would seem that $3,000 per mile (20,000 yards of earth) was a sufficient estimate for 17 miles of this line, and that grades of 20 feet per mile would be easily attainable. On the remaining seven miles at the Cumberland River crossing we will use 92-feet grades, as in crossing the Raccoon Mountain, instead of 76 feet, reducing the cost of construction to about $15,000 per mile, that amount being sufficient to make a solid rock cut 10 feet deep and half a mile long. In this estimate we do not include the Cumberland River bridge, which would be reduced

* In evidence of this fact we may add the following table:



PROFILE 4.

Outline sketch of the profile of the adopted line of the Cincinnati Southern Railway between Somerset and Chattanooga, showing a low-summit line of costly construction, with gradients comparatively ill adapted for operative economy. NOTE.—This profile has no pretention to correctness in detail. Operating Division 3, from Somerset to Hunnicuts, has about 28 miles each way on the maximum grade of 60 feet per mile. Operating Division 4, from Hunnicuts to Chattanooga, has about 17 miles each way of 40 feet grades, probably all in short sections.



PROFILE 5.

Outline sketch of the profile of the "Sequatchie Valley Line" for the Cincinnati Southern Railway between Somerset and Chattanooga, as deduced from the preliminary surveys, showing a high-summit line of cheap construction with gradients well adapted for operative economy, by the aid of assistant engines.

by such grades to about half the cost of the present crossing, or about $100,000.

Summarizing the estimated cost of constructing this line, we have:

Somerset to Monticello, 35 m..	Cumberland River crossing, 7 miles @		$15,000	$105,000
	" " bridge,			100,000
	Monticello Plateau,	17 "	@ 3,000	51,000
Monticello to Pl't'u C'm'd Mt 90 m....	" to ft. of C'm'b'd Mt.,	11 "	@ 6,000	66,000
	Ascent to C'm'b'd' Plateau,	8 "	@ 30,000	240,000
Plateau of C'mb'r'nd Mts., 70 m	State Line to Jamestown,	18 "	@ 16,000	288,000
	Jamestown to head of Seq. Valley,	52 "	@ 3,000	106,000
Seq. Valley, 54 m.....	Descent from C'm'b'd Plat.,	8 "	@ 40,000	320,000
	Pikeville to Tennessee R.,	46 "	@ 3,000	138,000
Tenn. R. to Chat. 16 m	Tennessee River bridge (as on present line)			300,000
	From " " to Chatt., 16 miles @		$20,000	320,000
Totals, 184 miles				$2,034,600

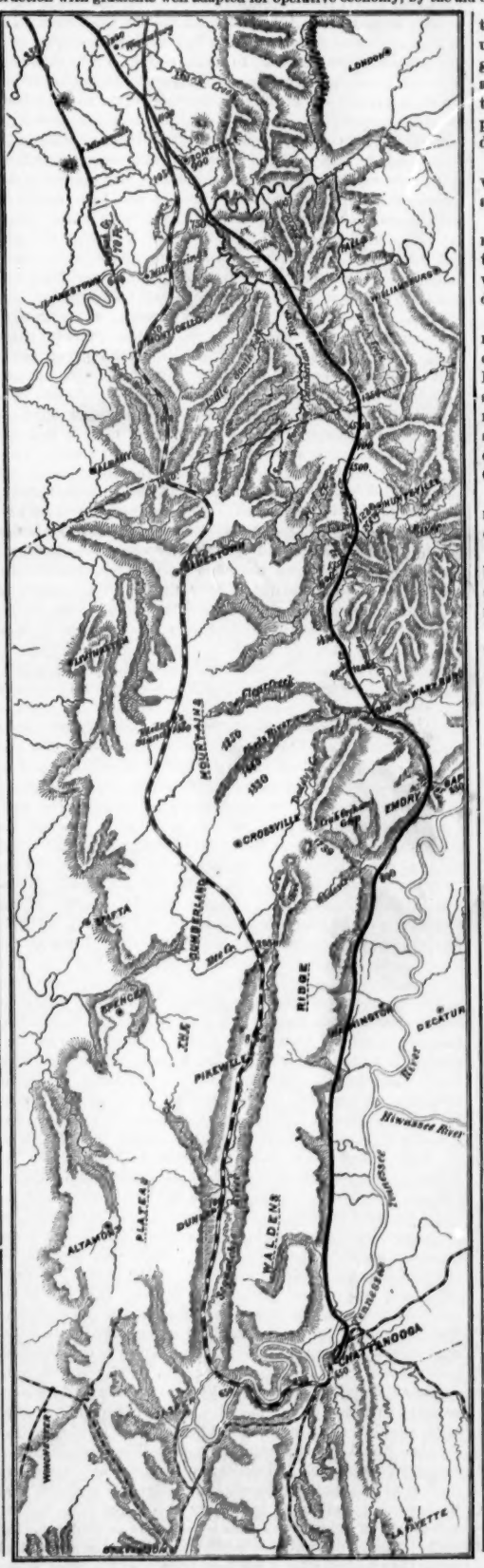
Out of the whole distance of 184 miles, 46 + 52 + 17 = 115 miles, is described as work of the lightest character, 11 miles as light, 41 miles as moderate and only 18 miles (which we assume to be reduced by higher grades to 16 miles) as excessively heavy, with the alignment described in the report, so that the writer cannot but regard this as a fair and more than ample estimate, but he admits that he may be influenced by his own prepossessions, and he will therefore increase the above estimate as follows:

Total previously determined	$2,034,000
Add 10 per cent. for any under-estimate at special points	203,400
Total	$2,237,400
Add 10 per cent. for any general tendency to under-valuation	223,740
Total	$2,461,140
Add 10 per cent. for any other sources of error	246,114
Total, showing estimated contract price for grading, bridging and masonry	$2,707,254
Actual and estimated contract price of the adopted line, for grading bridges and masonry	7,124,550
Balance, showing estimated saving in cost of construction in favor of the proposed line	$4,417,296

We may also tabulate the following comparative details:

	Adopted Line.	*Proposed Line.*
Length	177.4 miles	184 miles.
Tunnels. Number	25	Probably no tunnels, with grades proposed. The survey indicates several on each of the mountain grades and two others.
Length	22,081 feet / 4.2 miles	
Iron Bridges. (Exclusive of Cum'd and Ten. R.) No. of spans.	58	1 (Sequatchie River), 150 ft. long, all other requirements believed to be included below.
Total length	4,357 feet / 0.82 miles	
Iron Viaducts. No. of spans	27	1, at Cumberland River, 400 feet, and possibly several others on the monntain grades.
Length	10,321 feet / 1.95 miles	
Wooden Bridges. No. of spans	26	26
Length	611 feet	611 feet
Wooden Trestles.	1,100 feet	1,100 feet
Ruling Grades. NOMINAL	Operating Div. 3, 60 ft. per m.	One operating division: 142 ft. per m. 120 ft. per m.
	" " 4, 40 " " "	92 ft. per m. 50 ft. per m.
ACTUAL	" " 3, >75 " " "	20 feet per mile.
	" " 4, >50 " " "	

In explanation of what are given as the "actual" ruling grades, we need only add that a true ruling grade is one which *fixes the weight of trains.* Now a 60-feet grade increased by 6° curves is not a *ruling* grade, nor is it even a maximum grade in the meaning which that term conveys, because the grades on all tangents *might as well be* increased to 75 feet per mile and in fact considerably more, before they will exercise as great a limiting effect on trains as will a 60-feet grade on a 6° curve, and, however common the fault may be, it is excessively bad engineering not to do so. We cannot stop now to justify this position, for we shall do so in the following paper; but we have considerably understated the *true* limiting effect of curvature on grades. On the other hand, a location adapted to the use of assistant engines offers abundant facility for reducing grades heavily for curvature, at the points of greatest resistance, by the wide lee way which we have at such points as to the rate of grade, while the few and light curves on the higher portion of the line may, in this instance at least, be amply reduced without appreciable cost.



We can now proceed to consider the comparative OPERATING VALUE of the proposed line. Its broad features may be stated as follows:

1*st.* It constitutes in effect a single operating division, 184 miles long, over which the same engine will take the same train through without change, changing crews at any convenient point on the mountain. This makes a well-adjusted day's run under the long-trip system.

2*d.* At each terminus of this division a powerful pusher is required for three miles. It would probably be more economical to make this a kind of yard service at the Cumberland River, and let that be the terminus of the division; and at the southern end it might possibly be better to locate the first 16 miles out of Chattanooga with reference to operating it as a separate division, as a large trade from the Southwest would doubtless be received there which would never pass through Chattanooga.

3*d.* For about eight miles each way, at a single point in the middle of the run, powerful pushers would be required. These engines would make six or seven trips daily.

4*th.* A 20-ton assistant engine would *probably* be required between Jamestown and the State line, and if so we have assumed that this engine will also descend to the foot of the mountain, to push up returning trains.

Summing up the engine mileage required to run a train over the division, we have:

Through engines, 20 tons.	Going North.	Going South.
Chattanooga & Somerset	184	184
Jamestown, foot of Cumberland Mt	26	26
Totals	210	210
Pushers, 40 tons:		
At Chattanooga	3 × 2 = 6	3 × 2 = 6
" Somerset	3 × 2 = 6	3 × 2 = 6
On Cumberland Mountain	8 × 2 × 2 = 32	8 × 2 = 16
Totals	44	28

Estimating the mileage of the heavy pushers as being 50 per cent. more costly than that of the light through engines, we have as the total mileage required to move a train of 20.76 cars each way:

Through engines	420 miles.
Pushers, 72 miles, increased 50 per cent	108 "
Total engine mileage per train	528 "

Equal to a total engine mileage per car moved and returned over the division of 25.43 miles.

We will now compare with this the engine mileage required on the adopted line. Operating Division 4 is 84.4 miles long, with ruling grades of 40 feet nominal, and 50 feet actual, and Operating Division 3 is 93 miles long, with ruling grades of 60 feet nominal and 75 feet actual. On these grades a 20-ton engine will, according to the same standard by which we determined the net load on the proposed line (Table XVII., page 442), haul only 11.82 and 8.42 cars respectively.* Heavier engines will probably be used, but whatever advantage this may give is equally open to both lines, and, even if it were not so, we have already shown that the cost of increasing the weight of the same pattern of through engine is nearly as costly as is increasing their number. This is a very different matter from the relative cost of a heavy eight-driver pusher running only on a short incline and where speed may be decreased without appreciable loss. For the cost of 20 minutes' delay is not 1-60 of 20 hours delay, nor 1-600 part.

Estimating then the comparative engine mileage per car hauled required over the present line, we have:

On Division 3, 84.4 × 2 = 168.8 miles run by engine to move 11.82 cars ..... = 14.28 miles per car.

*Table XVII. was made up for a rolling friction of 10 lbs. per ton which was deduced from loads hauled over grades complicated with curvature. We use it now simply as a matter of convenience, and because, as we have already pointed out, the *difference* in the engine mileage per car, and hence the difference in operating value, remains precisely the same whether the car friction be taken at 1 lb., or 10 lbs., or 100 lbs. per ton, although the cost of operating *each* line is very greatly affected thereby. The above loads, however, are but little below the average loads in the daily routine of business, as we might show from statistics, except that it is of no present importance.

On Division 4, 93×2=186.0 miles run by engine to move 8.46 cars	=22.00	"	"	"
Total between Somerset and Chattanooga	36.28	"	"	"
" previously determined for proposed line.	25.43	"	"	"
Saving in engine mileage per car, on proposed line	10.85	"	"	"

a saving of almost exactly 30 per cent. of the engine mileage. If we estimate the cost of a train mile at $1.25 (less than on most of its rivals), we have seen, on page 436, that 48 per cent. of this sum, or 60 cents, may be assumed to vary directly with the engine tonnage. Then 30 per cent. of 60 cents = 18 cents per train mile require over the *present* line, as the saving in operating expenses over the proposed line. This is equal to $0.18 \times 177.4 \times 2 = \$63.86$ as the saving per train round trip, and this sum × 325 gives $20,756 as the yearly saving in favor of the proposed line, per daily train required over the present line.

As to the probable number of trains over the present line, it is wholly a matter of conjecture; but the Cincinnati Southern doubtless anticipates that in the near future it will have a business closely approximating to that now enjoyed by the Nashville & Chattanooga and the Louisville & Nashville railroads, which is over 16 trains daily. A business of 14 trains daily over the adopted line would show a yearly saving in operating expenses of $20,756 × 14 = $290,584 in favor of the proposed line, and capitalizing this sum at 7 per cent. we have as the difference in operating value in favor of the proposed line, $4,151,200.

In this estimate we have neglected several minor considerations, both pro and con, which we may briefly define. Those in favor of the proposed line are:

1*st*. A saving in cost of curvature. On one division of the present line there are 9,670° ± of curvature (104° per mile); and on the other, 3,270° ± (39° per mile). We may roughly estimate the curvature on the proposed line at 30° per mile for 156 miles, giving 4,680°, and at 120 per mile on the remaining 28 miles, giving 3,360°. Without going through the steps of the process, if the reader will increase these amounts in proportion to the engine tonnage passing over them, as suggested in the last two papers, he will find that the resulting difference represents a capitalized sum of about $275,000, at $3.48 × 1.25 per degree. There is also an inconsiderable advantage in the cost of rise and fall on the proposed line, which we pass over entirely. On the present line there are about 2,086 + 827 = 2,913 feet of rise and fall. On the proposed line the *necessary* amount will be seen to be only 1,630 feet. After reasonable increase, the difference between the two lines for this item s some $12.500.

2*d*. An exaggeration of the value of the distance saved by the present line. In estimating on the basis of the engine mileage, the relative value of the two lines so far as affected by distances, is necessarily assumed to be directly as the measured lengths, or as 184 to 177.4. The true ratio, as we have pointed out in considering the value of distance (page 389) is as 180.7 to 177.4. This error thus amounts to $\frac{3.3}{184}$ of $4,151,200, or about $75,000.

3*d*. A saving in the cost of maintenance of way, due, not to any difference in alignment or engine tonnage, but to a difference in topographical conditions. If we balance 110 miles of the two lines against each other as approximately equal, we have 70 miles of light work with hardly a box-drain on it on the top of a sandstone ridge as against 70 miles of exceedingly heavy work. Every trackman will appreciate the importance of this difference. The writer could hardly estimate it at less than 20 per cent., or say 7 cents per train mile, which would amount to $637,000.

4*th*. A saving in the capital invested in engines. Including the saving by consolidation of divisions this would be at least one-half, and allowing 80 engines at $8,000 each as the equipment of the present line, this would amount to $320,000.

Per contra, we have neglected the following considerations which operate against the proposed line:

1*st*. It is much more difficult to make a good connection with Knoxville and the important trade centering there. There is certainly a very grave disadvantage, although balanced in great degree by better facilities for reaching the more important trade of the West and Southwest. The difference in the cost of a branch to Knoxville, however, would be fully covered by $500,000, and when once built we may consider the operating advantages as equalized.

2*d*. We have neglected the loss arising from assistant engines standing idle in the yard. We will grant that these engines would average only 6-10 of a day's work, while having steam up all the time—a very excessive assumption. The cost will then be the same, as we have seen on page 544, as if the mileage were 1-6 greater without this loss. This will be found to decrease the difference in operating value by about 8 per cent., or $332,000.

Summing up these various minor items, we find we have a net balance of $1,307,000 less $832,000, = $475,000 in favor of the proposed line. We may now make a final summary as follows:

Difference in cost of construction, in favor of proposed line	$4,417,296
Difference in operating value, in favor of proposed line, for a business corresponding to that now transacted on railways between Chattanooga and Louisville	4,151,200
Minor items, balance in favor of proposed line	475,000
Total estimated difference in value, in favor of proposed line	$9,043,496

This is a vast sum, almost beyond belief, and we will therefore grant that unconscious prepossession has led the writer to exaggerate the various estimated advantages of the proposed line by as much as 100 per cent., in spite of his earnest endeavor to be more than fair. The difference is still sufficient for the moral which he designed to draw, and he has no other purpose in writing the present paper. It is needless to say that he personally believes the error to be in the other direction, *if* the business of the Cincinnati Southern Railway does in fact reach the proportions which its projectors have evidently anticipated and built their railway to transact. Moreover, we have as yet far from exhausted the possibilities, and one of these is so important that we must briefly suggest it. A glance at Profile 5 will show that there is a gradual fall on low grades from the summit northward. Now *if* it were possible to locate this with a level maximum going north, and eventually build from 60 to 90 miles of independent return track on the lighter portions of the line, with a level maximum going south—by adding a few miles run as assistant engines, mainly or entirely at their regular stations—we should realize all of the advantages of a double track, and at the same time approximate closely to the ultimate limit of economy in transportation. Such an alignment would be a method of utilizing the advantage of the gravity railroad without the disadvantage of stationary power, and the topographical conditions are in many respects singularly favorable. It is easier to suggest this than to accomplish it, but it is also easier to deny or forget the possibilty than to look for it.

Another possibility of much interest would have been the use of the *central rail system* in ascending to the plateau, or even inclined planes with stationary power. The topographical conditions are peculiarly favorable for either of these expedients, and although inclined planes have passed out of use in many cases, it does not follow that in other cases, with well-adjusted grades, they may not be exceedingly advantageous. So also with the central rail system, it is not at all necessary that a road should use this system throughout to reap its advantages, simply because most of them do so, and sound engineering should give all these possibilities the most careful investigation before rejecting such a line as this on account of a few miles of abrupt ascent. In these remarks it is by no means our wish to suggest that the engineering administration of the Cincinnati Southern Railway is especially open to criticism. On the contrary, it has been in very many respects especially admirable from the very beginning. Multitudes of other railways would furnish as striking instances of erroneous location, if the facts were known in the same detail, and among these we may mention three on which the loss has been nearly or quite as great as in the instance we have been considering, viz.: the Chesapeake & Ohio, the New York & Oswego Midland and the Blue Ridge Railroad, and from precisely the same cause, viz.: the neglect of possible advantages from the use of assistant engines in the vain attempt to get a line of *uniform low grade* through a mountainous country. This error is one of the gravest character, and it is continually committed; the great cause of it being that constructing engineers, as a rule, give no sufficient and comprehensive attention to the true and exact conditions of operative economy. When the road is finished, the "Chief Engineer" receives his modest stipend and departs, and the manager who succeeds him, rarely knowing anything about gradients or location, takes the line for granted as he finds it, and does not know, nor will he probably believe, that anything better is possible. And so, between these two stools, the intricate and difficult science of railway location has fallen to the ground, until it is hardly even *considered* important or intricate—and in no one respect has this process resulted in more unfortunate error than in the location of lines through mountainous and difficult country. If the writer were to lay down a broad general rule for sound location in such localities it would be this: Follow the easiest routes on the lowest grades possible for the longest distances possible; and then pass over the intervening distances on such grades as are then found necessary, by the aid of assistant engines. *On this system the rate of the high grades and even the altitude of the summits matters little or nothing*, within wide limits, and it is economical both in cost of construction and in operating expenses; although the full advantages of the system can be realized only in the hands of that exceedingly rare bird, a good engineer and a good railway manager in one and the same man; for it requires the nicest adjustment to each other of the alignment, the gradients, the locomotive power, and the daily management of traffic. It is therefore perhaps an unattainable desideratum, but no more forcible example of the correctness of the principle could be desired than is probably furnished by an alternate location for Operating Division 3 of the present line of the Cincinnati Southern Railway. The writer hesitates to use it, because no line has been run over it, but he has some personal knowledge of what would ordinarily be the most difficult part of this line, and if the indications there given are not deceptive, he does not hesitate to say that a better line than that adopted lies almost within sight of it for its whole length. This line would be as follows: Diverging from the present line on the summit between the Emory River and the South Fork of the Cumberland, to descend as speedily as possible on any convenient grade into the valley of Wolf Creek and the Cumberland River. If, as is usually the case, the valley widens and becomes more practicable as it descends, we have then a light and low grade line as far as the Cumberland River, the only difficulty being to keep above high-water mark. The average fall is only about eight feet per mile, and 20-feet grades might very probably be obtained over the whole distance of 85 miles, except for say 10 miles each way of any grade under 92 feet. This line would probably be very much cheaper as well as shorter and straighter than the present line; but if these advantages are all the other way, it would not much matter, for the saving in operating expenses would be an enormous percentage. With the same light engines and net loads which we have previously used for comparative purposes, the engine mileage per car round trip of 85 miles would be as 9.2 miles to 20.1 miles. Now it *may* be that this line would from wide and frequent gullies or other causes, encounter insuperable difficulties; but as it was not even examined, or at least not mentioned, it is altogether probable that the few miles required of grade over 60 feet per mile was the sole deterring influence. It was forgotten in searching for the costly chimera of a uniform gradient, which is a great deal worse than useless after it has been bought with a great price.

"The Complete Practical Machinist."

TO THE EDITOR OF THE RAILROAD GAZETTE:

That the reviewer in your columns of my book, "The Complete Practical Machinist," is not himself a practical workman is evident by the gross blunders into which he has fallen, and I am again reminded that none but those known as expert workmen are capable of understanding questions of actual workmanship. For example, your reviewer has confounded the "spring of tools" with spring tools, between which there stands about the same relation as there does between a "horse chestnut and a chestnut horse." He says that I have in my book thrown great stress upon spring tools, whereas in the whole of the 140 pages and 61 engravings devoted to turning work and tools *only one spring tool* is mentioned, and its qualifications are disposed of in 16 lines.

> "It's a pity when charming woman
> Talks of things which she don't understand,"

is a stanza of which I am reminded at almost every point in the review. That Holtzapfel wrote a book and that it is to be found in many places except in the workshop is true, and the reason that it is so is partly because of such absurd blunders as that recommended by your reviewer when he says that it is at all practicable to give a particular degree of clearance or angle for turning tools, whereas the fact is that the angle must always depend on several elements, such as size of work, distance of the tool edge from the tool post, hardness of the metal to be cut, size of the tool steel, etc., etc., and this is why Holtzapfel's book and Nasmyth's gauges are *conspicuous* in the workshop only by *their utter absence*.

Your reviewer errs in saying that the question of dragging the tool is not treated of in each case where it is possible. When speaking of holding tools first lathe tools are treated of and they you cannot drag, hence the subject is ignored there. When speaking of planer tools the drag is shown; so likewise is the case of boring bars.

"The use of 'spring' tools necessarily violates one of the author's own canons, a very good one, too, that 'all tools should be fastened or held so that their cutting edges are as near the tool post as possible;'" thus says your reviewer. Now I have shown that I have not recommended the use of spring tools, and have almost ignored their existence; and now let me show you how little your reviewer knows of the subject he attempts to judge of.

A tool of no matter what kind or shape springs away from the cut, or has a tendency to do so from the pressure of the cut, no matter how close to the tool post it is: *this* I have expatiated upon, *this* is the practical fact I have illustrated, and your reviewer has supposed the word spring thus applied to necessarily mean a spring tool.

And as to the existence of a spring tool violating the canon of holding tools close to the tool post, if you will measure the one spring tool illustrated in Fig. 18, you will find that its cutting edge can be held within 1¼ inches of the tool post, which is as close as the tools shown in Figs. 10 and 11 can be, and as close as can possibly be required.

In the paragraph reviewing the chapter on screw-cutting, the review says that the very existence of special bolt and nut-threading machines is ignored. *Of course* they are. My book is for turners, vise hands, planers, etc., and for the manipulation performed by the hands. Nowhere do I touch upon the construction or design of machines. Skilled machinists are *not put to work at bolt-cutting machines*. And more than that, the threads that skilled machinists are or should be called upon to cut *cannot* be cut in bolt-cutters.

The method of cutting bolt threads given by me is a quick way of cutting *true* threads, and the die nut or solid die is an assistant that saves having to keep the screw-cutting tool keen enough to finish with, and thus constant grinding; it also saves the necessity of very accurate grinding or setting of the tool, and at the same time insures truth, correctness in the size and the angles, and that without using either gauge or callipers, and thus it saves time.

Sir Joseph Whitworth has some little reputation as an authority upon threads, screw-cutting, etc. The Whitworth thread is more largely used throughout the world than any other thread existing. R. Hoe & Co. use it exclusively. The late A. W. Freeland, one of our very finest tool-makers, used it, and it is still used at his works. Now, sir, a Whitworth thread cannot be cut by a screw tool in a lathe, because it is a round top and bottom thread, and requires either a chaser or a solid die to finish it. Hence the space devoted in "The Complete Practical Machinist" to chasers and their uses. When your reviewer recommends a lathe hand to cut his threads in a bolt-cutter, he forgets that the threads that can be cut in the bolt-cutter are not given to the lathe hand. All the chapter on screw-cutting refers to lathe work; every tool illustrated is a lathe tool. Taps and dies (the tools used in bolt cutters) are treated of in a separate chapter, and the workmen would think it odd enough had I referred a turner or lathe hand to a bolt-cutter. The idea of taking a piece of work out of a lathe to put it into a bolt-cutter is as startling as it is new. Still it may be done, *providing you are afraid that you may cut a good thread.*

The auditory the book is directed to is not the designer of machinery or the consulting engineer: to him it is Latin or Greek; but to the men who get their living by working at the lathe, the planer, the shaper, the vise, etc., etc., which are *not special tools*, which are found in *every* machine shop, which labor-saving devices *cannot dethrone*, and which perform at least *three-quarters* of the work done in our *best* machine shops. Those things told over and over again in connection with one job and another are necessary to that job in each case; as I have learned in my course of teaching numerous apprentices and others, every "minute direction" guards against errors I have found liable to occur even.

In confining the finishing feed for cast iron at ¼ to ⅛ of an inch, I was governed by the fact that to the inexperienced eye the broad planing looks very well, but a fourteen-inch smooth file and a surface plate will show that a great deal of the broad

planing is anything but what it should be, and some of it exhibited is much worse than I would like to say. It is one thing to talk of work and praise it to a customer or purchaser; it is another to *actually test* it as I have scores of times.

It is somewhat strange that in all my book I have inserted but two subjects upon which my information was not the result of personal experience, and that in both these, although originally put forth under what should be good authority, there are errors to be corrected. One of these subjects is belts, the other estimating the weight of castings. And so far as your reviewer refers to the first of these I thank him for pointing out those errors.

That I did not give any data for calculating the proper length or diameter of journals is because the working machinist does not deal with such subjects. While he stands at his lathe, planing machine and vise, he will find my book concerns his duties; so soon as he is put to work upon some special machine which obviates the use of his manipulative skill, he will find my book losing its value to him, and so soon as he enters the domain of designing he will find its intent, purposes and usefulness still less within his requirements.

JOSHUA ROSE.

[We publish the above at the request of Mr. Rose. Nothing occurs to us that seems necessary to say in reply, excepting that the fact which he states that "the Whitworth thread cannot be cut by a screw tool in a lathe" seems a very great objection to that form of thread; and the fact that the Franklin Institute system, the threads of which are flat at the root and point, can be very easily cut in a lathe, is very much in favor of the latter. The latter, too, is much more extensively used in this country than the Whitworth threads and has much greater authority as a United States standard than the other, which is the English system.—EDITOR RAILROAD GAZETTE.]

The Railroad "Moss-Back."

TO THE EDITOR OF THE RAILROAD GAZETTE:

Not many years since, a resident of New York city, being a lover of that prince of sports, trout fishing, and not being averse to occasionally drawing a bead on the stately buck, betook himself to the forests of Maine, where among its lakes and streams he could indulge his favorite pastimes.

One day his camp was visited by a tall, yellow-haired man, who, after covetously viewing at a respectful distance the silver-mounted rod and rifle and other fancy trappings usually found in the camp of the amateur sportsman, gave the "cud" of spruce gum with which his mouth was nearly filled a roll to one side with his tongue, and ventured to inquire: "Where do you live, mister?"

The Gothamite promptly replied that he lived in the city of New York.

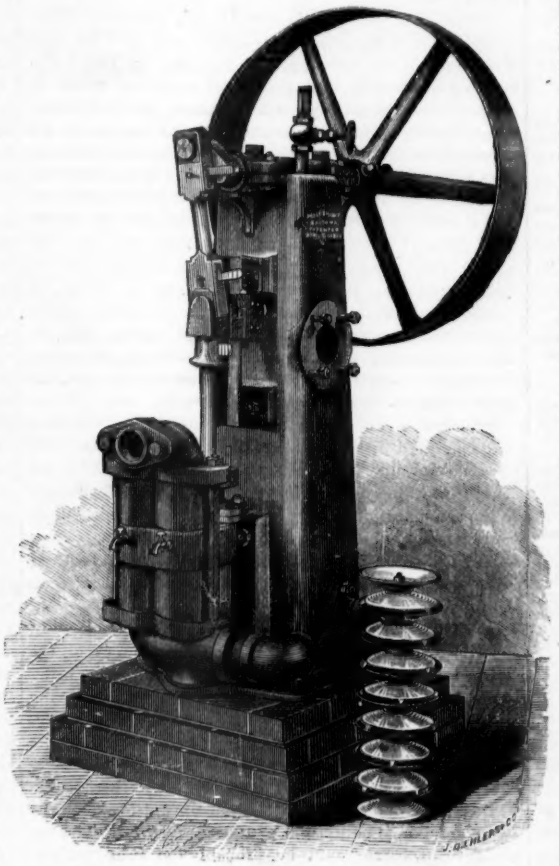
On hearing this a queer sort of an expression settled down over the countenance of the backwoodsman as he says to the New Yorker: "*I shouldn't think you would like to live so fur off.*"

This was spoken with an air and tone that we might call a cross between pity and contempt—pity that the stranger had not enjoyed the superior advantages which he (the native) fancied he had always been surrounded with in his backwoods home, and contempt for the little he thought the gentleman knew that was worth knowing of the "ways of the world," and especially of the science of enticing the five-pound speckled beauties to take a fast hold of the barbed hook, or of "winding" the wily buck. Now be it known that this tow-headed native had never heard of good Izaak Walton, nor did he know that among the "traps" of the stranger might be found a copy of "Forest and Stream," "The Angler's Guide," etc., etc.; and he had never heard of any such publications. But he knew the "runways" in that region, and he knew where the big trout "lay." He knew every "old stager" that had his favorite hiding place in deep water under the shade of a rock; those sly old fellows that had on many occasions stripped the bait from his hook by way of sport, with them he was familiar; and he had an abiding faith that no stranger need attempt to capture "them big trout" that had so often outwitted him. Now this man, who had exhausted his strategy many times and failed, was astonished on subsequent visits to the camp of the stranger to see his basket well stocked with the speckled monsters that he (the native) could never capture. Here was a mystery. That a man living "so fur off" as the city of New York could teach him the *science* of trout fishing was a wonder to the State of Mainer, whose principal food during his life had been trout of his own catching;—was something he could not understand. This man was what the vulgar would call a "moss-back." He was born there and had always lived there and was happy in the thought that of all places on earth his particular locality was superior to all others in every respect. He thought men who had been raised in *remote* corners of the globe must necessarily be sadly deficient in knowledge; that they did not know anything that was worth knowing. And this honest, simple-minded backwoodsman was precisely like a great many railroad men in this respect: They have been in business for thirty years in one particular locality, and if their backs are not literally covered with moss, their minds are clouded with *conceit*, and they turn up their noses in contempt for those whose experience has been more varied and "further off."

A few generations back, when parents and grandparents were not under the control of the rising generation, in giving advice to young men of a roving disposition, a parent made frequent use of the old adage that "a rolling stone gathers no moss." In such cases "moss" was understood to mean "filthy lucre." But if a young man should roll about somewhat and make proper use of his faculties, he might gather what is far more valuable than moss, to wit: knowledge. And he might gather scraps of useful knowledge even of a "moss-back." At all events he would be likely to wear bright by coming frequently in contact with others, whose sharp points he would not fail to discover and turn to good account.

There are very many worthy men who have had many years' experience in railroad business, and have become skilled in their departments of the service, and have acquired all their knowledge of the business on a single road; but these men, as a rule, are exceedingly liable to get "mossed over," or, in other words, covered over with *conceit*, and it is hard to convince them that their way of doing certain things is not the best in the world. And these men (like the man in Maine) profess to believe that if any one is in search of useful railroad knowledge, he should come there to get it, for they, in their long experience, have learned it all.

It may seem a little singular to a railroad man of the period, when there are so many and frequent changes in railroad administration, and in view of the fact that our railroad population is constantly on the move, that any such being as a "railroad moss-back" could be found in America. But there are many of them, and they may be found in all grades of the service, from a section foreman to a general manager. A few days since the writer chanced to discover a road in course of construction (or rather completion, for some of it has been in operation a long time), under the management



Feed-Water Heater and Pump, by Poole & Hunt.

of a "moss-back." Without going into a general history of the many long years of mismanagement to which this road has been subjected at the hands of the fossil who is still at its head, only a single instance will be mentioned here as a specimen of the economy he practices after a long experience. The ties are of all lengths, widths, kinds of timber, shapes, and degrees of rottenness and thickness. Their cross sections may be mentioned as elliptic, semi-elliptic, circular, triangular, trapezoidal, and rhomboidal in form, and the triangular ones were laid base upward and base downward, and in the latter case no spiking was possible. And this through a well-timbered country. But it is the *spikes* that will excite your wonder. The road-bed in the rear of the spikes was thick with spikeheads and broken spikes. In a walk of a mile or more scarcely a tie could be found without a broken spike in it, and many were found with two, three and four spikes broken, and one, a green white oak, *had seven broken spikes in it*, and four that had been driven nearly to place without breaking, *thus making eleven spikes to one tie!* A close examination disclosed no hammer marks on the tie or rails, and from the position of the stubs in the tie it was evident that the breakages all occurred in an honest way of business, and not through mischief or by some novice who was trying his hand at spike-driving for amusement. The above conclusion was ascertained to be correct on "interviewing" the foreman of the spikers. Many of the ties were left with only one whole spike in each, while some had two and some three whole ones, and as many broken ones. The spikers would use up all the spikes within their reach, then move on, and occasionally, with care a soft tie might be properly spiked without a break. In most cases of breakage the heads came off, but many of the spikes would snap into inch pieces, or break once or twice in two. By taking a spike with the point between the thumb and finger and striking it across a rail, it would break after a few smart raps. Several were broken in this manner by the writer, but they were some that were selected as being weak ones by being nearly burned in two when they were being manufactured. Smooth, sound-looking ones were readily broken by a single blow of the spike-maul by laying a spike for support under each end of the one operated upon. A few tested in this manner would bend a trifle before breaking when struck moderately heavy blows with a hammer. An examination showed these spikes to have been manufactured of very coarse material and at a tremendous heat, so powerfu as to entirely destroy the ductility of the metal, if it ever possessed any. Indeed, they had the appearance of having been made of the refuse and waste of the mill. The writer was unable to find any brand or mark on the kegs by which the name of the manufacturers might be known. Moreover, the spikes were of an exceedingly homely, awkward and bungling pattern, unlike anything in that line ever seen by the "oldest inhabitant," which fact is suggestive of foreign manufacture. When it is considered that the weather was mild, and no frost in the timber at the time above referred to, ane may readily imagine the trouble that a cold snap will bring to these track-layers. Announcements in the local papers along the line of this road are to the effect that "the road will immediately be put in good condition for a tremendous through traffic," which seems to have been secured in advance of the completion of the line. It is certain that the line is expected to be operated as a rival to some first-class trunk lines, and how the manager expects to do *any* but literally a *smashing business*, in the face of the above-mentioned facts (and they are *facts*, however fishy the spike story may appear) is not easy to conceive. What should ever induce any man in possession of the least common sense and business integrity to purchase such ties and spikes is indeed a mystery, but it is clear to those who "live further off" that if the same policy is carried out in the purchase of general supplies and equipment for the road, there is a dismal future in prospect for the owners. But it is presumable that the owners of the road belong to that large class of capitalists who believe they are fortunate in having invested in a railroad, and expect to become railroad kings very soon. They have put *thousands* into the hopper and expect it to come out MILLIONS; but they do not watch its course through the mill, and cons quently do not discover the many leaks that the moss-back miller allows to go unheeded, or perhaps has never noticed. They hold their bag at the delivery in high expectation of its being filled to overflowing; but, alas! nothing comes. The numerous leaks in the mill have wasted the whole.

If railroad shareholders would see to it that none but honest and competent men were entrusted with the disbursement of their funds, the moss-backs would find their occupation gone, and we should have better railroads—or, rather, fewer poor ones—and the owners would be happy. The R. R. M. B. may generally be known by his great aversion to mingling or associating with those he knows to be his superiors in knowledge from fear of exposing his own ignorance, and he is never known to express an opinion on any important railroad problem for the same reason, although he claims to be well up with the times in useful railroad knowledge. Some one has said that: "To sneer and denounce is a very easy way to assume a great deal of wisdom and to conceal a great deal of ignorance," and this the R. R. M. B. will do on every occasion to prove their own infallibility.

N. B. No one ever sees any moss on *his own* back.

WM. S. HUNTINGTON.

Poole & Hunt's Feed-Water Heater and Pump.

The engraving represents a very neat arrangement of feed-water heater and pump for stationary engines designed and constructed by Messrs. Poole & Hunt, of Baltimore, and exhibited by them at the Centennial. The pump, it will be seen, is driven by a belt and pulley which are attached to a hollow cast-iron stand, inside of which the water is heated. The cold water is admitted into an opening shown in the engraving near the top of the stand, and then flows in a small but continuous stream over and through a series of discs inside of the heater. A detached set of these discs is shown in the engraving outside of the heater

Unlike other heaters, into which exhaust steam from the engine is first discharged and then permitted to escape, this heater is simply connected to a branch from the exhaust pipe, in such a manner that a portion of the exhaust steam flows into the heater in sufficient volume to raise the feed-water to a temperature of 200 degrees or more. The free escape of the exhaust steam is not impeded in the slightest degree, nor is back pressure caused in the cylinder.

The condensation and refuse grease and other matter from the cylinder do not enter the heater, thus avoiding one of the gravest objections urged against "open heaters," which is, that the grease from the cylinders is transferred to the boiler through the heater and feed-pump, thus causing foaming with all its attending inconveniences and dangers.

The heaters are manufactured by the firm whose name and address are given above.

A Forcible Signal.

The Ashtabula (O.) *Telegraph*, of recent date, says: "During the severe snow storm of last Saturday, the way freight No. 8 was snowed in just this side of Rock Creek, and a train hand was sent back to flag the express train that was then about due at Rock Creek. The man was given a red flag, some torpedoes and a good-sized cinder, with the instruction to place the torpedoes on the track and to flag the train. Should these precautions not be discovered by the engineer, he was ordered to throw the large cinder through the cab window, as a last resort. He had not long to wait, for the express train came flying through the terrible storm, and the engineer—Patrick Findley—did not discover any of the signals, except that large cinder, which went through a window at his side and struck him in the mouth, knocking out two of his teeth. His fireman instantly reversed the engine and the train was brought to a stand, thereby avoiding a general smash-up. The express was only two train lengths from the freight when it stopped."

RAILROAD GAZETTE

Published Every Friday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

CONTENTS:

	Page.		Page.
ILLUSTRATIONS:		Record of New Railroad Construction	7
Handyside Steep-Gradient Locomotive	1	EDITORIAL NOTES	7
Map and Profiles, Cincinnati Southern Railway	3	GENERAL RAILROAD NEWS:	
Feed-Water Heater and Pump	5	Elections and Appointments	8
CONTRIBUTIONS:		Personal	8
Justifiable Expenditure for the Alignment of Railways	2	Traffic and Earnings	8
"The Complete Practical Machinist"	4	The Scrap Heap	8
The Railroad "Moss-Back"	5	Old and New Roads	9
The Boston & Albany Locomotive Experiments	7	ANNUAL REPORTS:	
EDITORIALS:		Providence & Springfield	9
Destroying the Erie Canal	6	New York, Providence & Boston	9
The Ashtabula Accident	6	Western Maryland	9
Exporting Fresh Meat	7	New York & Oswego Midland	9
The Grain Movement for 35 Weeks	7	MISCELLANEOUS:	
		Revised Rules for Interchanged Freight Cars	7
		Report of the British Railway Commission	11

Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

DESTROYING THE ERIE CANAL.

The report of the Canal Auditor of New York for the fiscal year ending with September is largely devoted to the effects of railroad competition on the canal traffic. He shows that the large reduction of tolls on the canals has been followed by a decrease instead of an increase of canal traffic, and he attributes it to the excessively low rates of the railroads, to which doubtless it is due. After saying that these low rates have doubtless caused a loss to the railroads, Mr. Schuyler adds:

"But if the effect of this competition shall be to destroy the canals and the lake interests as well, the roads will have abundant opportunity in the future to make good all their losses and reap substantial gains.

"This conspiracy of the railroads, although, for the time being, productive of cheap and unremunerative rates of transportation, causes no diversions from the trade of rival States, and threatens the impoverishment of thousands of individuals by rendering worthless the vast equipment of lakes and canals.

* * * * * * * *

"The State of New York made valuable concessions to various roads, which now form its main trunk line, to which they were not entitled under their original charters. If these concessions are being abused, and are likely to prove the destruction of our canal system and the source of onerous taxes, public policy and the public interest would seem to justify their revocation."

We have here then an official expression of opinion that the low rates of the past season were due, not to competition between railroad companies, but to a conspiracy among them intended to destroy the canal, which is the property of the State, and the lake marine, which brings the canal nearly all its traffic. The Baltimore & Ohio and the New York Central were not fighting with each other, but only pretending to do so to cover an attack on the water route. And it is suggested that railroad companies may be deprived of the right to carry freight (for it is this to which "they were not entitled under their original charters") because they have abused it, not by neglect to use it, but by using it too much; not by charging excessive prices, but for charging too little; not by affording inefficient service to the community, but rendering a service so much better and cheaper than any other that the community seems likely to give them their whole patronage.

This is not the first time that it has been intimated that the railroads, and the New York Central especially, have been working deliberately to put an end to transportation on the Great Lakes and the canal, and especially on the canal, the assumption being that if transportation by the water route be made unprofitable for two or three years, it will cease to be prosecuted forever thereafter, and that the abandonment of the Erie Canal would substantially destroy the water route.

Now as to the "conspiracy," probably nothing will have any effect on the minds of those who have determined to believe in that; but we may nevertheless call attention to the fact that it is not necessary to explain the facts. It is unquestionably true that a very large quantity of grain was carried last winter, after the canal was closed, to Philadelphia and Baltimore; that these cities and the railroads carrying to them received so large a proportion of the entire grain crop as to threaten seriously the business of New York and the New York railroads; and that the latter might reasonably be expected to take some steps to attempt to prevent a continuance or increase of this diversion of traffic. The declared object in reducing rates so low was to effect such a change in the rules for fixing rates to the different ports that produce might be exported as cheaply by way of New York and the New York railroads as by any other port, and, so far as appears, this result has been secured. That is, the injury to the lake and canal traffic was an incident and not the object of contest.

Competition with the lakes and canal, however, is just as legitimate as any other competition, and will be even if it results in the destruction of business by that route. It is not impossible that a railroad company would do work at a loss for some years if it seemed probable that it could thereby remove a competitor and so secure the whole traffic for itself, with liberty to make the rates as high as the traffic would bear. But it is not probable that such a contest would be begun unless it seemed probable that it would be successful, that the competitor would be, not simply injured, but finally removed. In the case of two competing railroads, such a result is practically impossible. A railroad company may be ruined by competition, but its railroad remains, and usually about as formidable as ever as a competitor for traffic. But the whole argument that the railroads are trying to destroy the water competition rests on the assumption that the water route can be substantially destroyed.

Doubtless if rates are made low enough and continue long enough, canal boats will disappear, the State will have no revenue from tolls, and will no longer keep the canal in working order. But that will not be a calamity to the community if it gets its carrying done for less than could be afforded on the canal. What is feared is that, having destroyed the canal, the railroads would raise their rates, and make them higher than could be afforded on the canal.

Now there are several obstacles to such a course. In the first place, it would require a combination of all the railroads from Montreal to Baltimore, not an easy thing to secure for such an object; next, there would be the abandoned canal and the State its owner at its back, supported doubtless by an overwhelming public opinion. At comparatively small cost and in a short time the canal could be made as effective as ever, and then there would be no chance of a second abandonment until transportation should be unquestionably cheaper by rail than by canal; third, there would be, probably ten times as efficient as now, the route by the Welland Canal and the St. Lawrence River, which will soon afford a route for grain exports as cheap as the Erie Canal ever was, and possibly much cheaper.

As to the effect on lake navigation, they can hardly be serious who talk of destroying that. There is a channel that can no more be destroyed than the sea itself; and though vessels may be driven from the grain trade, there will remain an enormous fleet engaged in carrying ore and lumber ready to take cargoes of grain whenever the railroads make the rate high enough for it to pay. Indeed, it is not so certain that even the extremely low rates of last summer left no profit for all classes of vessels as it is that the average cost of lake transportation has been and is being greatly reduced by increasing the size of lake vessels. We see that even last year there was an increase in the lake marine, and that the new vessels were on the average large ones. If the railroads expect to destroy the competition of the lake marine, they will have not only to make the rates lower than the vessels can afford before they get their business, but keep them so afterwards; and if they can do that, nothing can save the lake grain trade.

If, then, there is, as Mr. Schuyler says, a "conspiracy" of the railroads to destroy the competition, we believe it will fail; but if it may possibly be successful, it is quite proper that, as the Canal Auditor says, there should be an exercise of "great sagacity and fearless legislation" to extricate the canal interests from their peril. The only thing he suggests is, that the right to carry freight in competition with the canals may be taken from the New York railroads.

Let us see what would be the effect of this—not that there is the slightest probability of the adoption of such a measure. Two of the conspirators would be removed from the field, and the only two which carry large quantities of produce to New York; but there would remain the carriers to Baltimore and Philadelphia, beyond the reach of the New York Legislature, and ready and glad to carry all that the New York roads would have received, but delivering it at ports out of New York. The Erie Canal would be destroyed just the same, and the State would have the satisfaction of compelling the great New York railroads and the grain trade of New York city to share its fate.

Such legislation, it seems to us, while undoubtedly "fearless," would not indicate "great sagacity." If the canals are to be preserved and continue effective in drawing business to New York, and earning an income on their cost, it will hardly be by making the railroads charge more, but rather by such improvements as will reduce the cost of transportation on the canals, and it may be well worth while to ascertain if the latter is not practicable.

The Ashtabula Accident.

Before this number of the *Railroad Gazette* reaches its readers, the great majority of them will doubtless have seen full accounts of the dreadful disaster which occurred on the Lake Shore road last Friday night. No effort is needed to bring the inexpressible horrors of that event vividly before the imagination of our readers; but the plain duty now before us and before all railroad managers is, to learn the lesson which such calamities always can teach, but which often require very careful study and examination to learn.

It occurred on one of the most carefully, and, we may say, conscientiously, managed roads in the country; one of which the Superintendent is an engineer who stands in the front ranks of the profession, and who, from our own knowledge we can say, has given more attention to making the bridges on his line as safe as possible than perhaps any other railroad manager in the country. At the time of our writing, the cause of the accident is not known, at least to the public, and probably not by any one. Speculation about it would therefore be unprofitable. Judging by the light of the past, it seems probable that it was due to some defect or mistake in the design of some of the details or connections of the parts of the bridge. It may, we think, be safely stated that the failures of bridges are seldom due to the fracture of the main members, but in the great majority of cases to some mechanical defect in the details or the manner of fastening the parts together. Such defects are hard to discover, and often only the most careful investigation will reveal the true cause, if indeed it can be discovered at all.

Now that the accident has occurred, the question which above all others should be asked and answered in the fullest, clearest, most intelligent and public way is, to what cause was the accident due? Without such an answer our American system of iron bridge-building, of which we have been so proud, will suffer a very severe shock, especially from the hands of foreign critics. For some days there will doubtless be wild appeals in the daily papers for a "thorough investigation," and ignorant and therefore useless speculations regarding the theory and cause of the accident, such as the one in a daily paper which attributed it to the fact that "the resistance of the iron is exhausted after a certain period." Unfortunately, after such disasters in this country, whatever investigations are made are quite certain to be either by persons entirely ignorant of the subject to be investigated, or by those who are interested in hiding whatever culpability or error may have been the cause of them. Coroners' juries are proverbial for their stupidity, and when the subject to be investigated involves some of the most abstruse questions in engineering, it is evidently hopeless to expect that they will be able to discover the real cause under the mass of testimony which must be heard to deduce the true cause from the many abstruse facts involved, or draw correct conclusions from premises involving profound mathematical and scientific questions. It is very rare that either coroners or coroners' jurors have any special training which would qualify them for investigating intelligently the causes of ordinary railroad accidents, and when such inquiries involve some of the most profound questions of engineering science, the average coroner and his jury are as helpless and imbecile as so many children would be in dealing with the facts or in drawing conclusions therefrom.

On the other hand if such investigations are delegated to the officers of railroads themselves, then we have judge, jury and counsel deliberating on a case in which each is or may be vitally interested; in which some are possibly or probably culpable; and in rendering a verdict, if "the truth, the whole truth and nothing but the truth" is told, they may be imposing enormous penalties on the company to which their fealty and from which their salaries are due. Even without such selfish motives, the temptation is great to shield a companion officer, or to lay or not lift the mantle which would or does cover some fact which would reveal the true cause of the disaster, and which would be a verdict of condemnation of a superior officer whose voice might be potent to retain or dismiss the very people who pronounce the decision.

That the officers of the Lake Shore road might find themselves in such a position if they should make an investigation of the Ashtabula disaster is indicated by a statement made by a correspondent of one of the New York daily papers, in which it was said that "the bridge was built eleven years ago, the original plans being furnished by John Towlinson, of Canada, who is now director of Canadian lighthouses. On submitting the plans Mr. Amasa Stone, then President of the road, insisted upon some material changes in the plans, to which Mr. Towlinson strenuously objected, and the discussion on this point grew quite warm, Mr. Towlinson finally declaring he could not hold himself responsible if the proposed changes were insisted upon. The bridge was erected on the modified plans, and when nearly completed it was found that the structure was too short to span the space between the piers, and for three months the work remained untouched. At the end of that time the bridge was completed. It was built in the car shops of the company."

We have no means of knowing whether all or any of the facts related above are true. Knowing how such information is usually gathered, there is room for "wholesome doubt," but they have a sufficient amount of possible trueness that, having been publicly disseminated, they should be investigated. As Mr. Stone was President of the road at the time the bridge was built, was afterwards General Manager, and is still a prominent director, the officers of the road are manifestly disqualified to sit in judgment of the alleged facts.

Now this being the case, what shall be done? Must such investigation be intrusted to the bungling and stupid inquiries of mere local coroners without any special qualifications for such work, or must we accept only such information as railroad officials may choose to give to the public? In the present condition of things, this is undoubtedly the only alternative. The only courts which represent the interests of the public, at least so far as investigation into the causes for the purpose of preventing similar accidents are concerned, are coroners' juries, and the voluntary verdicts which the railroad companies may choose to render. After an accident, among the first things usually done by the companies themselves, who are *prima facie* the culprits, is to remove all evidence indicating the cause of accidents, usually without reference to finding out the reason for their occurrence.

The moral which we wish to suggest should be drawn from the late sad calamity is, that there should be some competent authority created by the state whose duty it should be to make a thorough investigation of all railroad accidents which result in loss of life. The Board of Trade in England is such an authority, and accidents are there carefully investigated and full reports thereon made, giving all the facts and conclusions relating thereto. Competent engineers are employed by the Board for this work. A board of railroad commissioners might act in such a capacity here, if they were made entirely independent of political influences.

If the terrible sacrifice of human life which is made each year on our railroads is to have any use at all, it is to teach us how to avoid accidents in future. To disregard entirely such costly lessons and to allow the victims to be carried to their graves and leave no warning to those who are left behind, is to add to the crime of our own ignorance or carelessness that of indifference to a warning which is made more impressive than the religious rites of barbarous tribes of all ages, who sought to appease the wrath of the gods by a sacrifice of human life much less cruel than that which attended the fall of the Ashtabula bridge.

The Grain Movement for Thirty-five Weeks

The shipments of grain of all kinds from the eight principal Northwestern markets for the 35 weeks ending with Dec. 23 have been, in bushels:

	By lake.	By rail.	Total.	Per cent. By rail.
Heretofore reported.	67,428,425	56,928,153	124,356,578	45¾
Week ending Dec. 23.		1,168,217	1,168,217	100
Total for 35 weeks	67,428,425	58,096,370	125,524,795	46¼

The rail shipments are large for the season but lower than before this fall and winter and but two thirds of the average since navigation opened, while the total shipments were but one-third of the average.

For the same 35 weeks the receipts of the different Atlantic ports have been:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	22,335,753	34.3	61,041,453	47.6
Boston	7,054,444	10.8	10,133,167	7.9
Portland	629,876	0.9	1,064,656	0.8
Montreal	3,493,881	5.4	11,401,527	8.9
Philadelphia	14,649,525	22.5	22,594,335	17.6
Baltimore	14,699,700	22.5	18,653 585	14.5
New Orleans	2,339,394	3.6	3,408,119	2.7
Total	65,202,573	100.0	128,296,842	100.0

Compared with their standing at the end of the previous week, New York has fallen considerably in rank, both in corn and in all grains; Philadelphia has gained in both but in corn not so much as Baltimore, which now passes Philadelphia and stands second only to New York in corn receipts.

During the week ending Dec. 23 46¼ per cent. of the corn arrived at Baltimore, 30 per cent. at Philadelphia, 14 per cent. at New York, and 7½ per cent. at Boston. During the same week of the total grain receipts 34¾ per cent. arrived at New York, 30½ per cent. at Baltimore, 26 per cent. at Philadelphia, 6¾ per cent. at Boston.

More than three-fourths of the corn thus went to Baltimore and Philadelphia and but one-seventh to New York; something more than one-half of the grain of all kinds was received in Baltimore and Philadelphia, and a little more than a third at New York. The latter received four-fifths of all the wheat, however.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Wallkill Lime & Cement Co.—This company has completed a line from Hamburg, N. J., west to Hardiston, 2 miles. It is of 3 ft. gauge and a private road.

Chicago & Alton.—A branch is completed from Braidwood, Ill., west by north to Coal City, about 6 miles.

St. Louis, Keokuk & Northwestern.—Extended from Louisiana, Mo., southeast to Clarksville, 10 miles.

Gulf, Colorado & Santa Fe.—Extended west 15 miles to Arcola, Tex.

Galveston, Harrisburg & San Antonio.—Extended from Santa Clara, Tex., west to the Cibolo River, 14 miles.

Corpus Christi, San Diego & Rio Grande.—The first track is laid from Corpus Christi, Tex., westward 5 miles. It is of 3-ft. gauge.

This is a total of 52 miles of new railroad, making 2,330 miles completed in the United States in 1876, against 1,426 miles reported at this time for 1875, 1,923 in 1874, 3,883 in 1873, and 7,340 in 1872.

THE TRUNK LINE AGREEMENT seems to hold good, in spite of fears expressed that it would never really go into effect. East-bound freight rates were raised Monday five cents per hundred on grain and fourth-class from Chicago, making 35 cents for grain and 40 for fourth-class, which are probably as high as can be maintained this winter without affecting traffic unfavorably yet are unusually low winter rates. Moreover, passenger rates were advanced the next day, not to the $22 New York-Chicago rate prevalent a year ago, but to $18 for limited tickets. So far as appears, all parties are now anxious to keep the peace. The delays in the settlement of details by the freight agents who were in session before Christmas were due to the novelty and complexity of the work in hand, and not to any disagreement on vital issues. Another session is to begin Thursday of this week, and there is no present reason for believing that it will not be able to accomplish its work. How the new agreement will work of course can only be known by trying it; but the trial it seems likely to get.

THE LAKE MARINE appears to have grown smaller in 1876. The Chicago *Inter-Ocean* publishes lists of the new tonnage of the year and also of the lost tonnage. The latter exceeds the former by 1,539 tons. The new vessels number 12, with 8,451 aggregate tonnage. Four of the new vessels, with more than one-half of the total tonnage, were steamers. The tendency to an increase in the size of vessels is shown by the fact that while the 12 new vessels measured 8,451 tons, the 9,990 tons lost was in 38 different vessels; that is, the average tonnage of lost vessels was 258 tons, that of new vessels was 704 tons. The valuation of the new vessels is $366,000, or at the rate of $41 per ton—something less than the average cost of freight cars per ton of capacity. The new tonnage is less than half that of 1875, and little more than *one*-eighth that of 1874, the figures for the three years, beginning with 1874, being 74,496, 18,978 and 8,451. The unprofitable rates of the past three years are doubtless the cause of the decline.

Contributions.

The Boston & Albany Locomotive Experiments.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In looking over the last annual report of the "American Master Mechanics' Association," my attention was called to an appendix containing the report of a series of trials of locomotives on the Boston & Albany Railroad, tending to prove the superiority of the standard eight-wheeled engine (as built by the Boston & Albany Railroad Company at Springfield) over the Mogul engine, or those of other patterns having more than two pairs of driving-wheels connected.

Many of the details of these trials are interesting and, perhaps, instructive, but there are many points of interest connected with these trials which are entirely omitted from the reports, as: Were these engines worked to their full capacity? Did they run each way over the road at nearly the same time of day? What was the amount of water evaporated per pound of coal? How many miles did each engine run? How many *loaded* "car-miles" did each make? How many pounds of coal did each consume to the "car-mile"? How lately had the flues been reset in each of the boilers? Did they both use the same kind of fuel? What was the size of the exhaust nozzles in each case? What was the amount of lead given to the valves on each engine? What was the area of openings in the grates in each engine?

Answers to all of these questions would be interesting and tend to show the cause of the large difference in expenses for fuel. Another point comes up in this connection—which is: Why was there so great a difference in the proportions of lap and lead to the valves in these engines? The cylinders are of the same dimensions, the travel to the valves the same, but there is a great difference in the outside and inside lap to the valves; and would not a change in the proportions of these parts make a diference in the results attained?

The proportions of these engines differ widely. The eight-wheeled engine has 18×26 in. cylinders to 43,000 pounds on the driving-wheels. The Mogul has 18×26 in. cylinders with 55,200 pounds on driving-wheels. Our most prominent locomotive builders give to engines of 16×24 in. cylinders from 42,000 to 48,000 pounds on the driving-wheels, and to engines with 18×22 in. cylinders from 48,000 to 57,000 pounds on the driving-wheels. Now like proportions for large cylinders like those used in this trial would call for at least 60,000 pounds on the driving-wheels to give the necessary adhesion to work the cylinders to their full capacity.

The conclusions come to in the report are peculiar, to say the least; that is "that the Springfield boiler combined with the perforated dry-pipe, with the throttle in the smoke-box, together with small steam-ports, to cylinders" in the one engine, and "the extra pair of wheels in the other," were the cause of the wide difference in the results shown. The report says it "will leave the engineering world to speculate upon it as it will."

It would undoubtedly be *speculative* to draw any conclusions from the meagre data given. The trials may have been both "elaborate and exhaustive," but the report of them seems quite the reverse. W.

[In estimating the size of the cylinders, our correspondent does not make allowance for the *size* of the wheels, which has an important bearing on their proportions, it being self-evident that an engine with small wheels loaded with a given weight would not require as large cylinders as one with larger wheels and carrying the same weight. We agree with him, however, in thinking that more information is needed regarding the experiments referred to before it would be safe to draw any conclusions therefrom. —EDITOR RAILROAD GAZETTE.]

Revised Rules for Interchanged Freight Cars.

The following is the report of a meeting of railroad superintendents and master car-builders held in Chicago, Dec. 14 and 15:

F. D. Adams, Master Car-Builder of the Boston & Albany Railroad; Leander Garey, New York Central & Hudson River; John Kirby, Lake Shore & Michigan Southern; Wm. McWood, Grand Trunk; Henry Childs, Great Western of Canada; John Ortton, Canada Southern; R. B. Moore, Flint & Pere Marquette; F. N. Finney, Superintendent Toledo, Peoria & Warsaw; R. M. Hemphill, Master Car Builder Toledo, Peoria & Warsaw; John Bailie, Chicago, Milwaukee & St. Paul; A. J. Prescott, Detroit, Eel River & Illinois and Logansport, Crawfordsville & Southwestern; G. N. Prescott, Pittsburgh, Cincinnati & St. Louis; James Gormley, Pittsburgh, Cincinnati & St. Louis; William F. Smith, Cleveland, Columbus, Cincinnati & Indianapolis; E. T. Jeffrey, Assistant Superintendent of Machinery, Illinois Central; B. K. Verbryck, Chicago, Rock Island & Pacific; Robt. Miller, Michigan Central; Wm. Campbell, Chicago & Northwestern.

Also James T. Furber, Superintendent Boston & Maine; Charles S. Turner, Superintendent Worcester & Nashua; R. Reniff, Master Car-Builder Chicago & Alton; R. V. Coon, Troy & Boston, were represented by letter.

The meeting was called to order by Leander Garey, of the New York Central & Hudson River, and Wm. McWood, of the Grand Trunk, chosen Chairman, and John Kirby, of the Lake Shore & Michigan Southern, Secretary.

After a general and thorough discussion of the several subjects presented, the following were adopted as the

REVISED RULES

governing the condition of, and repairs to, freight cars for the interchange of traffic:

1. All cars delivered to connecting lines must be in good running order, with journal boxes and bearings in good condition; wheels sound, free from flat spots exceeding two inches in length or diameter, or flanges with flat vertical surface extending more than seven-eighths of an inch from tread of wheel, or less than one inch thick; axle journals not less than two and three-quarters inches in diameter, and brakes and draw-bar attachments in efficient condition. Each company to give foreign cars upon its line the same care and attention given its own.

2. Wheels and axles used to replace those broken under fair usage will be charged to the company owning the car. Closely connecting lines may, however, furnish wheels or axles to replace those broken under their cars, when giving notice previously of such choice, and paying freight and duty to destination, on wheels or axles furnished and scrap returned. Second-hand wheels may be used (without charge, except for labor of refitting) to replace wheels removed from other causes than breaking.

3. Prices for wheels and axles to be as follows: One new 33-in. narrow-tread wheel (less old) fitted on same axle, $10; one broad-tread wheel (less old) fitted on same axle, $11; two new 33-in. narrow-tread wheels (less old) fitted on same axle, $18; two broad-tread wheels (less old) fitted on same axle, $20; one new axle turned and fitted (less old) $8.

Loose wheels may be re-fitted on second-hand axles, and charged $2 per wheel, or per pair. No charge to be made for the axle, and all shop marks on such wheels and axles must be reported upon the bill to the road owning the car. Prick-punching the wheel seat of axle, or shimming the wheel, shall not be allowed.

4. One railroad company rendering bill against another for wheels and axles *shall note on bill* the manufacturer's name and date found on such wheels or axles removed, together with the railroad company's marks, with the number, class and line of cars from under which they were taken, and date of removal.

5. When cars or parts of cars are repaired or replaced by companies not owning the same, the standard form and material used in the original construction must be followed in detail. Any company departing from this rule shall be liable for the cost of changing the same again to its standard, proper credit to be given for material removed.

6. Cars must be returned to connecting lines in as good general condition as when received, and each company must bear the expense of running repairs and damages to all cars while upon its line.

7. Car inspectors at terminal or junction stations, and agents at junctions where there are no inspectors, must promptly inspect on arrival all cars offered for interchange, and make a record of the defects of cars not in good order and decline receiving them until the needed repairs are made; provided, however, if a car be loaded and in safe running order, it may be forwarded, if the company delivering agrees to receive it back in like condition, or will order the repairs made and charged to them by the receiving company.

8. When cars are destroyed on foreign roads, the owners must be notified immediately, that a settlement may be speedily effected; in settling, it shall be optional with the company destroying whether it will rebuild the car or pay the cost of replacing it, less 6 per cent. per annum upon the yearly depreciated value of the parts destroyed, since last built. In case of disagreement on any point not covered by this rule, each company shall appoint an arbitrator, with power to select a third party, to decide the point of difference, or fix upon the value of the betterments to the car, in case of rebuilding.

9. In case the delivering and receiving inspectors disagree as to the condition of a car, the case is to be immediately referred to the superintendents or their representatives.

10. When one railway company repairs cars for another (as per Rule 7), material shall be charged at cost, and 15 per cent. added to the net cost of the labor.

11. Sills broken or materially injured must be replaced by new ones of the same size and of good quality, an exception to be made of intermediate and outside sills to which the draw timbers are not attached, which, if broken between bolster and end sill only, may be spliced with a "ship splice" of not less than 24 inches in length and secured by three five-eighth inch bolts, all in a workmanlike manner.

12. Iron castings (interchanged) shall be charged at 3½ cents per pound; journal bearings 32 cents per pound.

13. These rules shall take effect from and after Jan. 1, 1877.

14. Upon an application to the Chairman, in writing, of seven railway companies, parties to this agreement, it shall be the duty of the Chairman to call another meeting for revision of the rules, the articles to be revised to be stated in the call.

WM. MCWOOD, Grand Trunk Railway, Chairman.
JOHN KIRBY, Lake Shore & Michigan Southern Railway, Secretary.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Newport and Maysville.—The board of directors of this new company has elected Alfred Gaither President; John J. Hay, Secretary; G. C. Goss, Treasurer; J. R. Hallam, Counsel. The office is in Newport, Ky.

Wheeling and Lake Erie.—The full board of directors is now as follows: A. W. Hendry, Sandusky, O.; F. G. Lockwood, Erie County, O.; W. A. Mack, Huron County, O.; Cyrus McNeely, J. B. Baxter, Wm. Davidson, James Aiken, Harrison County, O.; Henry Ainesworth, Medina, O.; A. K. Robinson, Portage, O.; L. W. Sutherland, Jefferson County, O.; L. M. Roby, Carroll County, O.; T. W. Chapman, Stark County, O.; E. D. Otis, Wayne County, O. The board has elected Mr. A. K. Robinson, late Chief Engineer, President.

Illinois Central.—Mr. J. C. Clark, late General Manager, is elected Second Vice-President, and it is understood that he will have especial charge of the company's interests south of Cairo, which will include the management of the New Orleans, St. Louis & Chicago road, as soon as the foreclosure is completed. Mr. Joseph F. Tucker, General Superintendent, succeeds Mr. Clarke as General Manager.

Lowell & Lawrence.—At the annual meeting in Lowell, Mass., Jan. 1, the following directors were chosen: W. E. Livingston, Otis Allen, Edward Tuck, John F. Kimball, Isaac Farrington, H. C. Stone, H. Hosford. The board elected W. E. Livingston President; F. H. Nourse, Clerk and Treasurer. The road is leased to the Boston & Lowell.

St. Louis, Bloomfield & Louisville.—At the annual meeting in Bloomfield, Ind., last week, the following directors were chosen: F. A. Wilson, A. C. Voris, W. C. Winstanley, Bedford, Ind; L. S. Smith, N. W. Williams, Owensboro, Ind.; Jason N. Conly, Bloomfield, Ind.; Dillan Rickets, Aquila Jones, Franklin Landers, John Thomas, W. O. Rockwood, W. Mansur, E. S. Alvord, Indianapolis.

Chicago, Iowa & Kansas.—The first board of directors is as follows: J. H. Sanders, Clinton, Ia.; John Crerar, D. Wright, F. Cameron, H. G. Angle, Chicago; Thomas M. Nelson, of Michigan. The officers are: President, H. G. Angle, Chicago; Secretary, J. W. Brontlinger, Clinton, Ia.; Treasurer, A. L. Stone, Clinton, Ia.

Rome, Watertown & Ogdensburg.—This road has been divided into two divisions, and Mr. J. W. Moak appointed Superintendent of the Rome, Watertown & Ogdensburg Division, which includes the lines from Rome to Cape Vincent, Ogdensburg and Potsdam. Mr. E. A. Van Horn is appointed Superintendent and J. W. Brown Assistant Superintendent of the Lake Shore & Syracuse Division, which includes the line from Richland through Oswego to Lewiston with the branch from Sandy Creek to Syracuse.

Mr. Wm. H. Harris is appointed Master Mechanic, in place of Abraham Klohs, resigned.

Peoria, Pekin & Jacksonville.—Mr. Henry O. Canfield has been appointed General Freight Agent. He has been performing the duties of that office very acceptably since the resignation of Mr. Cook in August last.

Utica & Ilion.—The first board of directors of this new company is as follows: Lewis Lawrence, D. B. Goodwin, Hiram Hurlburt, C. E. Barnard, A. B. Johnson, John D. Kernan, W. B. Gates, Wm. A. Everts, T. W. Spencer, Geo. W. Chadwick, D. N. Crouse, Jas. McQuade, Theodore F. Butterfield. The officers chosen are: President and Treasurer, Lewis Lawrence; Vice-President, D. B. Goodwin; Secretary, Hiram Hurlburt; Executive Committee, Lewis Lawrence, chairman, J. D. Kernan, D. N. Crouse, James McQuade, Hiram Hurlburt. The office is in Utica, N. Y.

Cincinnati, Rockport & Southwestern.—The United States Circuit Court at Indianapolis has appointed D. C. Branham, of Madison, Ind., and W. O. Rockwood, of Indianapolis, Receivers, on petition of several creditors.

PERSONAL.

—Mr. P. Norton, General Traveling Agent of the Lake Shore & Michigan Southern, died in Elmira, N. Y., Dec. 25. He had been connected for over 20 years with the Lake Shore, or the roads by whose consolidation the present company was formed, and was widely known.

—Mr. Carl O. Wederkinch, who did some very delicate and difficult engineering work in the Hoosac Tunnel with great success, and was subsequently employed on the Sutro Tunnel in Nevada, is now in charge of the Silver Islet silver mines on the Canadian shore of Lake Superior.

—Mr. A. J. Ware, Superintendent of the Peoria & Springfield road, was presented with a handsome silver set on Christmas Day by the employes of the road.

—Mr. Wm. Wickham Reeve, for over 60 years a civil engineer, died at his residence in Middletown, N. Y., Dec. 25, aged 84 years. He was employed in the first surveys made for the Erie and later located the Middletown, Unionville & Water Gap road and was Consulting Engineer on the Midland.

—Superintendent G. W. Bentley, of the New London Northern, has been appointed Commissary General on the staff of the Governor of Connecticut.

—It is stated that Gen. R. H. G. Minty, for two years past General Superintendent of the St. Louis & Southeastern Railway, has resigned his position.

—Mr. Abraham Klohs has resigned his position as Master Mechanic of the Rome, Watertown & Ogdensburg Railroad.

—Mr. J. Waldo, General Freight and Ticket Agent of the Houston & Texas Central, recently had an arm broken and received other injuries, the car in which he was riding having been thrown from the track and upset.

—Mr. A. A. Hobart, for many years an officer of the Chicago & Northwestern Railway, latterly as Superintendent of the Milwaukee and Wisconsin divisions, but recently engaged as Assistant General Superintendent of the Chicago, Burlington & Quincy was presented Saturday evening last with a silver service valued at $1,000 by his former associates on the Northwestern. Mr. Hobart is esteemed as one of the most capable officers in the country in the conduct of train service, and, as this presentation indicates, he has been a popular as well as an efficient officer. It is noticeable that the Chicago, Burlington & Quincy, which has been a great school for railroad officers in the Northwest, has now at the head of its operating department two men who were trained on the Chicago & Northwestern, Mr. W. B. Strong, General Superintendent, having come to the Burlington from that road a few years ago.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1875–76.	1874–75.	Inc. or Dec.	P. c.
Year ending Sept. 30:				
Fitchburg	$1,859,455	$1,696,637	Inc.. $162,818	9.6
Expenses	1,329,838	1,326,502	Inc.. 3,336	0.3
Net earnings	$529,617	$370,135	Inc.. $159,482	43.1
Earnings per mile.	10,722	11,153	Dec.. 431	3.8
Per cent. of exps..	71.52	78.18	Dec.. 6.66	8.5
Eleven months ending Nov. 30:	1876.	1875.		
Atchison, Topeka & Santa Fe	$2,282,135	$1,367,774	Inc.. $914,361	66.8
Expenses	1,082,346	614,171	Inc.. 468,175	76.2
Net earnings	$1,199,789	$753,603	Inc.. $446,186	59.2
Per cent. of exps..	47.43	44.90	Inc.. 2.53	5.6
Cleveland, Mt. Vernon & Delaware..	348,357	393,342	Dec.. 44,985	11.4
Houston & Texas Central	2,781,292	2,554,706	Inc.. 226,586	8.9
Louisville, Cin. & Lexington	1,034,186	1,043,086	Dec.. 8,900	0.9
Expenses	728,000	.....	.....	....
Net earnings	$306,186	.....	.....	....
Per cent. of exps..	70.41	.....	.....	....
Month of October:				
Atlantic, Mississippi & Ohio	$200,000	$172,498	Inc.. $27,502	15.9
Wellington, Grey & Bruce	31,121	30,820	Inc.. 301	1.0
Month of November:				
Cleveland, Mt. Vernon & Delaware...	$30,526	$35,367	Dec.. $4,841	13.7
Third week in December:				
Atchison, Topeka & Santa Fe	$47,842	$41,202	Inc.. $6,640	16.1
Denver & Rio Gra'de, Main Line	6,672	8,902	Dec.. 2,230	25.1
Denver & Rio Gra'de, Trinidad Ex.	2,675	.....	.....	....
Grand Trunk	146,583	197,166	Dec.. 50,583	25.6
St. Louis, Iron Mt. & Southern	128,100	122,806	Inc.. 5,294	4.3
Week ending Dec. 8:				
Great Western, of Canada	£13,890	£17,389	Dec.. £3,499	20.1

Through Passenger Rates.

A general advance in through passenger rates is one of the results of the new agreement between the trunk lines. The old and new rates from New York are as follows:

New York to	New rate.	Old rate.
Cleveland	$11 00	$8 00
Toledo	13 50	10 00
Detroit	12 00	10 00
Cincinnati	16 00	11 00
Indianapolis	17 00	12 00
Chicago	18 00	13 00
Louisville	20 00	15 00
St. Louis	23 00	17 00

Fares from Boston are $1 more and from Philadelphia $1 less than New York. The new rates took effect Jan. 3.

Grain Movement.

Receipts and shipments of grains of all kinds for the week ending Dec. 23 are reported as follows, in bushels:

	1876.	1875.	Increase.	P. c.
Lake ports' receipts	2,711,115	2,231,724	479,391	21.5
" " shipments	1,168,217	788,772	379,445	48.1
Atlantic ports' receipts	1,841,230	1,395,857	445,373	31.8

The receipts at lake ports have been much larger than the shipments for some weeks, and stocks must be accumulating quite rapidly.

Chicago receipts and shipments for the week ending Dec. 30 were:

	1876.	1875.	Inc. or Dec.	P. c.
Receipts	1,000,190	743,707	Inc.. 256,483	34.5
Shipments	440,046	457,773	Dec.. 17,727	3.9

Baltimore grain receipts for the year ending Dec. 31 were:

	1876.	1875.	Inc. or Dec.	P. c.
Flour, barrels	1,413,973	1,478,440	Dec.. 64,467	4.4
Grain, bushels	29,551,920	15,029,126	Inc.. 14,522,794	96.6
Total bushels	36,621,785	22,421,326	Inc.. 14,200,459	63.3

The exports in 1876 were 426,332 barrels flour, 1,659,861 bushels wheat and 20,953,184 bushels corn, being a decrease of 6 per cent. in flour, of 19.1 per cent. in wheat, and an increase of 200.2 per cent. in corn.

Railroad Traffic.

Shipments of through freight eastward over the Central Pacific in November were:

	1876.	1875.	Increase.	P. c.
San Francisco, tons	5,061	3,220	1,841	57.2
Interior points	736	281	455	161.9
Total, tons	5,797	3,501	2,296	65.6

The principal items were 2,400 tons wool and 881 tons tea. The shipments from Sacramento included a car-load of sheep, a somewhat unusual item.

Eastward Freight Rates.

The following rates were agreed upon at a meeting held in Chicago, Dec. 31:

Chicago to	Fourth class, per 100 lbs.	Grain, per 100 lbs.
Albany, N. Y.	35 cents.	30 cents.
Baltimore	35 "	30½ "
Philadelphia	36 "	31½ "
New York	40 "	35 "
Boston	45 "	40 "

The new rates took effect Jan. 1.

New York Live Stock Receipts.

The receipts of live stock at New York for two years have been, as reported by the New York *Tribune:*

	1876.	1875.	Inc. or Dec.	P. c.
Cattle	481,243	458,094	Inc.. 23,149	5.0
Calves	125,594	117,580	Inc.. 8,014	6.8
Sheep	1,247,820	1,228,530	Inc.. 19,290	1.6
Hogs	1,282,171	1,388,541	Dec.. 106,370	7.7

The average weekly receipts of each for three years have been:

Year.	Beeves.	Cows.	Calves.	Sheep.	Hogs.
1876	9,005	75	2,370	23,544	24,192
1875	8,713	97	2,261	23,626	26,703
1870	6,847	97	2,210	28,152	17,108

Coal Movement.

Coal tonnages for the week ending Dec. 23 are reported as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Anthracite	349,605	283,564	Inc.. 66,041	23.3
Semi-bituminous	55,201	.....	.....	....
Bituminous, Pennsylvania	42,037	.....	.....	....

The two closing weeks of the year generally show a very light tonnage and are this year no exception to the rule.

Norfolk Cotton Business.

Norfolk cotton receipts for December were 82,284 bales, a decrease of 9,843 bales, or 10.7 per cent., from 1875. For the calendar year the receipts were:

	1876.	1875.	Increase.	P. c.
Atlantic, Mississippi & Ohio R. R., bales	346,301	178,167	168,134	94.4
Seaboard & Roanoke R. R.	414,340	224,303	190,037	84.7
Canal and otherwise	70,836	39,867	30,969	77.6
Total	831,477	442,337	389,140	88.0

Of the receipts in 1876, 256,227 bales were consigned to Norfolk and 575,250 bales were through cotton, for shipment to points beyond.

THE SCRAP HEAP.

Railroad Manufactures.

The Baldwin Locomotive Works, at Philadelphia, have about 1,000 men employed, but are running at present on half-time only. About 230 engines were built last year.

The Evansville (Ind.) Rolling Mill is running on contracts which will keep it at work for several months.

The Ohio Iron Company's furnace at Zanesville, O., has blown out for repairs.

The Keystone Bridge Company's Works, at Pittsburgh, are running full time, and some of the shops overtime.

The Edgar Thomson Steel Works, near Pittsburgh, resumed work Jan. 2 after a short stoppage. The employes have decided to accept the reduced wages offered to them.

The Ferndale (Pa.) Rolling Mill is running double turn, with a number of orders on hand.

The Allentown (Pa.) Rolling Mill has some orders for railroad iron for Cuba.

The Roane Iron Company's Mills, at Chattanooga, Tenn., are very busy, with orders for several months on hand.

The Schenectady Locomotive Works have an order for 10 engines for the New York Central & Hudson River road.

The Southern States Coal & Iron Company is building two blast furnaces at South Pittsburgh, Tenn., and is opening several coal and iron mines in the Sequatchie Valley.

The J. & N. Scoville Car Wheel Co., at Buffalo, N. Y., is turning out about 90 wheels per day.

M. C. Isaacs & Co., of Chicago, manufacture locomotive track brooms for use in removing light snow, sand and similar obstructions.

The Dickson Manufacturing Co., of Scranton, Pa., is building six engines for the Michigan Central and is altering from 6 ft. to standard gauge 17 engines for the Delaware, Lackawanna & Western and four for the Albany & Susquehanna.

The Ohio Falls Car Co., at Jefferson, Ind., recently shipped a lot of box cars for the Alabama & Chattanooga road.

The Hinckley Locomotive Works, at Boston, are building six engines for the Columbus & Toledo road.

The Assignee of the Milwaukee Iron Co. has been authorized by the United States District Court to make contracts for iron which will not take more than 30 days to fill.

Test of an Iron Bridge.

A span of iron bridge was recently built by the Detroit Bridge Company for the Hannibal & St. Joseph Railroad bridge, over the Missouri River, at Kansas City. A formal test of the same was recently made by P. Smith, Chief Engineer of the railroad company, with the following result: Length of span, 175 ft.; width of bridge, 20 ft.; depth of truss, 27 ft.; number of panels, 12. The bridge was loaded with cars containing stone and iron, making up a total moving load of 347,300 lbs., say 173½ tons uniformly distributed. The original camber of the span at centre was two inches. Under the imposition of the load, the deflection at the centre was seven-eighths of an inch, and at the quarters half an inch. The load being removed the bridge recovered its original curve.

A Prophetic Text.

At a meeting held recently in Cleveland, O., in aid of the work of the mission to railroad men established in that city, Rev. Dr. Aiken delivered an address, taking for his text the following verse from the Prophet Nahum: "The chariots shall rage in the streets; they shall jostle one against another in the broad ways; they shall seem like torches, they shall run like the lightnings."

British Rail Exports.

The exports of railroad iron of all kinds for November and for the eleven months ending with November were:

	1876.	1875.	Decrease.	P. c.
November	29,797	33,621	3,824	11.4
Eleven months	388,670	521,833	133,163	25.5

To the United States there were no exports in November, 1876, and but 121 tons in 1875. During the eleven months the exports to the United States were 579 tons in 1876 and 6,959 tons in 1875. For all exports for the 11 months the average value was £9 in 1876 and £10 in 1875.

The Reading Railroad Bridge at Falls of Schuylkill.

Mr. Edwin M. Snyder, of Pottstown, Pa., son of the late Antes Snyder, writes as follows to the Philadelphia *Ledger:*

"In the description of the exhibit of the American Society of Civil Engineers, it is stated 'The Reading Railroad bridge at the Falls, built after Dutton Steele's design, is, perhaps, the best specimen, and stands to-day as the model bridge in the country.' This is an error, as Antes Snyder, Civil Engineer and graduate of West Point, was the *designer* and builder of the bridge at the Falls of Schuylkill. He was the first engineer sent to England to buy rails and locomotives for the old Columbia Railroad. He was a relative of, and intimate with Benj. H. Latrobe, Esq., of Baltimore, who, I am sure, is cognizant of the facts stated by me. Antes Snyder was Engineer of the Roadway Department of the Philadelphia & Reading Railroad at the time the structure in question was built; G. A. Nicolls, Esq., being then the Chief Engineer of the road. It is well known, and can be proved, that from the first sketch of a design to the laying of the last stone of this bridge *Antes Snyder* was the *designer* and *builder.*"

Apparatus for Working the Block System of Signals.

In a paper by M. Ramaeckers, engineer-in-chief of the Belgian State Railroads, read before the Brussels Congress, he describes the apparatus of Messrs. Siemens & Halske as follows: "The most effective appliances for partially or entirely superseding hand-signals are those for carrying out the block system; and the most perfect, as regards safe and easy working, is the apparatus exhibited by Messrs. Siemens & Halske. By an ingenious arrangement, the signals which constitute the limits of the block-system sections, and which close each section while being traversed by a train, are connected with one another electrically, so that an effective action can be exercised from one station to another on the mechanical working of each apparatus. This connection satisfies the condition that, for one signalman to be able to change his signal from 'danger' to 'line clear,' the signalman after him (as regards the train)

must have put his signal to 'danger.' It is, then, sufficient, for the safety of the traffic to be absolutely guaranteed, that no signalman puts his signal to 'danger' before it shall have been passed by a train. With these appliances, for a collision to be possible through a faulty position of the signals, all the signalmen on the line, two miles apart and between whom there can be no communication, must neglect their duty, a combination scarcely likely to occur. The decisive reason of the superiority of Messrs. Siemens & Halske's appliances, which are in use on the Ghent & Ostend line, is that, on account of the nature of the currents, the working of the signals is completely uninfluenced by atmospheric electricity, a condition which has not before been realized."

The Race to Ruin.

The following letter, signed "A Horse-Owner," appears in *Herapath's Railway Journal*, headed "Sport in Canada":

"MR. EDITOR—An exciting race is now taking place between two well-known horses in Canada—'Grand Trunk' and 'Great Western'—ably ridden by two most determined jockeys. Many American sportsmen are lookers-on, and highly amused, as it is well known that the owners of the horses are in Europe. The knowing ones say the race will be a dead heat in every sense of the word, as neither horse can possibly reach the winning post alive. The jockeys seem to like the sport, but what will the owners of the horses say? We all know how a man rides a hunt when he finds the spurs and another man the horse."

ANNUAL REPORTS.

Providence & Springfield.

This company owns a line from Providence, R. I., westward to Pascoag, 22.8 miles, with an equipment of 3 engines, 4 passenger and 77 freight cars. It passes through a thickly settled country with several large manufacturing villages.

The property is represented as follows:

Stock ($22,682 per mile)	$517,150
Bonds ($19,956 per mile)	455,000
Total ($42,638 per mile)	$972,150

The earnings for the year ending Sept. 30 were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c
Passengers	$40,366 84	$42,078 99	Dec.. $1,712 15	4.1
Freight	42,952 64	41,808 81	Inc.. 1,143 83	2.7
Mails, express, etc.	3,248 69	4,065 08	Dec.. 816 39	19.9
Total	$86,568 17	$87,952 88	Dec.. $1,384 71	1.6
Expenses	45,409 11	45,066 83	Inc.. 342 28	0.8
Net earnings	$41,159 06	$42,886 05	Dec.. $1,726 99	4.0
Gross earnings per mile	3,796 74	3,857 58	Dec.. 60 84	1.6
Net earnings per mile	1,805 22	1,880 97	Dec.. 75 75	4.0
Per cent. of expenses	52.45	51.24	Inc.. 1.21	2.4

The income account was as follows:

Net earnings	$41,159 06
Bonds sold	5,000 00
Posts sold	280 00
Bills receivable	2,844 25
Total	$49,283 31
Land damages and construction account	$9,585 04
Notes paid	3,899 03
Interest paid	31,227 66
	44,711 73
Surplus for the year	$4,571 58

The President's report says: "Our road the past year, in common with others, has suffered from the continued depression in general business, also from the stoppage of two of the large mills in Burrillville; the great flood last spring carried away the reservoir, seven dams, one mill entire and damaged others. The business of the road must have been quite one-third less than it would have been had all the mills run full time. One of the bridges near Oakland was carried away by the flood and others damaged; the engine-house at Pascoag was unroofed by a gale of wind, all of which has been put in good repair. With all these drawbacks we have been able, by careful management and strictest economy, to earn money enough to pay running expenses and interest on the bonds, and a small surplus, which has been applied to settling right of way claims, building depots, etc. During the year passenger depots have been built at Dyerville, Allendale, Allenville and Stillwater and the road-bed and rolling stock kept in good repair. With our finances in a sound and healthy condition, with a revival of business the road should do much better in future."

Western Maryland.

This company owns a line from Baltimore west by north to Williamsport, Md., 90 miles, and works under lease the Emmittsburg Branch, from Rocky Ridge to Emmittsburg, 7 miles. This branch was worked only for ten months of the year, having been opened for travel at the close of November, 1875. The report is for the year ending Sept. 30, 1876.

The capital account at the close of the year was as follows:

Stock subscriptions ($7,596 per mile)	$683,632
Funded debt ($40,833 per mile)	3,675,000
Bills payable	48,391
Revenue account	145,257
Suspended debts	3,604
Total ($50,621 per mile)	$4,555,884

The road is practically owned by the city of Baltimore, which holds a controlling interest in the stock and a large part of the bonded debt, and has a large claim against the company for money advanced to pay coupons. The city also owns the depot of the road in Baltimore, which was completed during the year, and which is leased to the company by the city.

The work done for the year was as follows:

	1875-76.	1874-75.	Increase.	P.c.
Passengers carried	342,566	309,425	33,141	10.7
Tons freight carried	112,690	106,798	5,892	5.5

The passengers were classified as follows: Full fare, 176,690; two-thirds fare (clergymen), 2,740; half fare (children), 4,936; commutation and mileage, 68,115, and excursionists, 90,076. The freight traffic has not yet shown the increase that was expected when the extension to Williamsport was completed, but is nevertheless growing steadily, and promises to continue to do so. The general depression of business has been unfavorable not only to the freight business, but also to the excursion and pleasure travel, which is no inconsiderable item of the receipts of the road.

The earnings and expenses were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$139,313 42	$139,864 85	Dec.. $551 43	0.4
Freight and express	148,356 66	131,510 81	Inc.. 16,845 85	12.8
Other sources	24,232 47	22,342 38	Inc.. 1,890 09	8.5
Total earnings.	$311,902 55	$293,718 04	Inc.. $18,184 51	6.2
Expenses	215,556 18	194,420 02	Inc.. 21,136 16	10.9
Net earnings	$96,346 37	$99,298 02	Dec.. $2,951 65	3.0
Gross earnings per mile	3,254 74	3,263 53	Dec.. 8 79	0.3
Net earnings per mile	1,005 39	1,103 31	Dec.. 97 92	8.9
Per cent. of exp'n's.	69.11	66.19	Inc.. 2.92	4.4

During the year, in addition to the $311,902.55 above reported as revenue for 1876, there was actually earned and paid to the Baltimore & Potomac and Northern Central railroads, for tunnel and other trackage, $25,486.32, not included in the above statement.

The expenses for the year were increased by the rent ($16,000 per annum) paid for the new Hillen Station in Baltimore, and by the fact that extensive repairs had to be made to several of the engines and cars, and by increased expenditures consequent upon increased freight tonnage.

During the year several new stations were built, considerable additions made to the sidings, eight new passenger and 37 freight cars added to the equipment and good progress made in ballasting the road with stone. The cost of these improvements was $62,757.62. The City Council appropriated $200,000 for the Hillen Station, which is completed, and a balance of $2,521.25 remains, making the cost, including land, $197,478.75.

The results of the year have, on the whole, been encouraging, showing a decided increase of business under generally unfavorable circumstances. Much is expected from the proposed Harrisburg & Potomac connection and the construction of a projected branch to Chambersburg.

New York, Providence & Boston.

This company owns a line from Providence, R. I., southwest to Groton, Conn., 62.5 miles, and it maintains a steam ferry by which its trains are carried across the Thames River from Groton to New London. The road is a part of the Shore Line from Boston to New York and also has connection with New York by a steamboat line from Stonington. There are 50 miles of second track and 7.75 miles of sidings; 32.48 miles of track are laid with steel rails.

The equipment consists of 26 engines, 31 passenger and 9 baggage cars, 111 box and 112 flat cars, 16 gravel cars. The company also owns three large steam ferryboats. All the passenger equipment is provided with the Miller platform and the Westinghouse brake.

Besides this property the company has a considerable amount invested in connecting branch lines and owns a large and, we believe, controlling interest in the Providence & Stonington Steamship Company, whose lines run between New York and Stonington and New York & Providence.

This property is represented as follows:

Stock ($48,000 per mile)	$3,000,000
Bonds ($18,608 per mile)	1,163,000
Total ($66,608 per mile)	$4,163,000

The annual interest charge is $78,150 or $1,250.40 per mile of road. The present report covers a period of thirteen months ending Sept. 30, 1876, the fiscal year having been last year changed so as to end Sept. 30 instead of Aug. 31, as before.

The work done was as follows:

	1875-76.	1874-75.	Inc.	P. c.
Passenger train mileage	370,119	.....	.....	....
Freight " "	180,511	.....	.....	....
Other " "	57,720	.....	.....	....
Total	608,350	.....	.....	....
Through passengers carried	188,875	157,907	30,968	19.6
Local " "	460,961	430,010	30,951	7.2
Commuters "	119,928	104,294	15,634	15.0
Total	769,764	692,211	77,553	11 2
Passenger mileage	19,570,190	.....	.....	....
Tons through freight	201,344	181,870	19,474	10.7
" local "	70,563	64,533	6,030	9.3
Total	271,907	246,403	25,504	10.4
Tonnage mileage	10,128,540	.....	.....	....
Average pass'ger train load—No.	52.88	.....	.....	....
" freight " " —tons.	56.11	.....	.....	....

The receipts and expenses for the 13 months were as follows:

Passengers	$516,272 43
Freight	399,743 79
Mails	10,014 06
Rents, interest and miscellaneous	26,511 86
Road receipts ($15,240.67 per mile)	$952,542 14
Dividends, Providence & Stonington Steamship Co	112,686 00
Total	$1,065,228 14
Working expenses (62.99 per cent. of road receipts)	600,026 58
Net earnings	$465,201 56

The directors' report says: "Deducting the receipts and expenses for the month of September, the gross earnings for the year ending 31st August are $973,857, and gross expenses $548,807, leaving net earnings $425,050, or $16,500 in excess of the corresponding period last year. Pursuing the comparison still further, we find that, discarding all revenue from outside sources, we have gross earnings for 1876 $844,000, as against $830,000 for 1875; and on the same basis of calculation, the net earnings are $25,000 in excess of previous year. This gratifying result is due chiefly to receipts from freight business alone, as, deducting the passenger business of September from the passenger business of the thirteen months, there is shown a slight falling off in that department from the preceding year. It should be remembered, however, that the Centennial travel did not fairly commence until Sept. 1, the receipts from through passengers for that month being $10,000 in excess of September, 1875—the month of October showing a still larger increase.

"As already stated, the gross expenses for twelve months are $548,807, being $11,000 less than last year, notwithstanding that during the same period the trains have run 38,000 more miles, and for the whole thirteen months the number of miles run by all trains is 604,670, being 83,484 miles more than the previous year."

The general balance sheet for the 13 months is as follows:

Balance from previous year		$57,324 80
Gross receipts		1,065,228 14
New stock sold		500,000 00
A. & W. Sprague, account of loan		2,281 00
Total		$1,624,833 94
Expenses	$600,026 58	
Dividends	287,500 00	
Interest	81,650 00	
Extraordinary expenses, Richmond Switch accident	144 19	
Construction account	186,976 83	
Stock Narragansett Pier R. R. Co	15,000 00	
Improvement bonds paid	100,000 00	
Bills payable paid	175,000 00	
Paid Providence & Stonington Steamship Co	65,000 00	
		1,511,297 60
Balance, cash and cash assets		$113,536 34

During the year, 1,757 tons new steel rails and 41,416 new ties were laid; 2,000 iron rails were repaired and relaid and 54 new Tyler switches were laid. The bridge at Apponaug was rebuilt and others repaired and a needed addition made to the shops at Providence. A new steam ferry boat was bought and fitted up, making three owned, of which the oldest and smallest is to be sold. There were built in the shops one baggage and seven freight cars; bought, one engine, three passenger and one baggage car, and the company paid its proportion of one baggage and two passenger cars for the Shore Line. A new ferry slip has been built at New London. The question of a bridge there has begun to be discussed.

In accordance with the policy of the company the Narragansett Pier Railroad was aided by a subscription of $15,000. The Warwick Railroad has not been worked since Aug. 1, and it is not known when operations will be resumed.

During the year nine persons have been killed on the company's road and ferry, six of them from their own carelessness and three from the explosion of a locomotive boiler, the cause of which a strict investigation failed to discover. It was the first accident of the kind in the 44 years of the existence of the road.

New York & Oswego Midland.

From a brief statement made public by the Receivers for the year ending Sept. 30, 1876, the following figures are taken. The stock and debt at the close of the year, as compared with the previous year, were as follows:

	1876.	1875.
Stock paid in	$6,800,522	$6,800,522
Funded debt	16,073,500	16,073,500
Floating debt	6,498,502	6,411,961
Total	$29,372,524	$29,285,983
Cost of road and equipment	26,228,409	26,172,640

The stock and funded debt remain unchanged; there is an increase of $86,541 in floating debt and of $55,769 in cost of road. The road worked was the same as for the previous year, 249 miles of main line, from Middletown to Oswego, and 122 miles of branches, 371 miles in all.

The equipment is also unchanged and consisted of 86 engines, 77 passenger train and 1,759 freight-train cars. There were 234,870 passengers and 228,103 tons of freight carried during the year. The earnings for the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$114,708 32	$141,482 38	Dec.. $26,774 06	18.9
Freight	354,207 20	393,355 05	Dec.. 39,147 85	10.0
Other sources	66,929 76	57,753 42	Inc.. 9,176 34	15.9
Total	$535,845 28	$592,590 85	Dec.. $56,754 57	9.6
Transportation expenses	486,699 43	633,063 93	Dec.. 146,364 50	23.1
Net earnings, or deficit	$49,145 85	$40,473 12	.....	....
Gross earnings, per mile	1,444 33	1,597 28	Dec.. $152 95	9.6
Net earnings, per mile	132 47	.....	.....	....
Per cent. of exp'n's	90.83	106.83	Dec.. 16.00	15.0

The result of the the operations for the year was as follows:

Net earnings		$49,145 85
Interest paid	$3,565 66	
Rentals	78,500 93	
		82,066 59
Deficit		$32,920 74

The *gross* earnings for the year were only 2.37 per cent. on the funded and floating debt. Notwithstanding this unfavorable showing the Receivers have done some work in the way of improvements of the road. A number of trestles have been rebuilt: 95,000 new ties and 500 tons of iron rails put in the track; the long cuts between Sandburg and Westfield widened and ditched; a retaining wall 700 feet long built on the long side-hill cut at Hell Hole and the track ballasted on the heavy grades at Walton.

OLD AND NEW ROADS.

The Ashtabula Accident.

On the evening of Dec. 29, about 8 o'clock, an express train on the Lake Shore & Michigan Southern road broke through a bridge over Ashtabula Creek, at Ashtabula, O., and fell some 70 feet into the creek below. The train, which was running slowly at the time, the track being obstructed by snow, consisted of two engines and 11 cars—a baggage, a mail and an express car, five passenger and three sleeping coaches. The first engine broke loose and reached the western end of the bridge, but all the rest of the train went down, the cars breaking through the ice of the shallow creek and being, of course, badly broken up. Before anything could be done to rescue passengers from the wreck it caught fire in several places and the flames spread so rapidly that many were burned to death. The number of killed cannot be definitely ascertained; five persons only escaped uninjured, 58 were saved who had received more or less severe wounds, and some 55 bodies were recovered, most of them being burned so as to be recognized with difficulty or not at all. The estimates of the number on the wrecked train vary from 225 down to 131, the last being made by the conductor, who should have exact information. Accepting his estimate, there would be 78 persons killed, quite enough to make the accident one of the most terrible on record, and the most deadly ever known in this country.

The bridge which gave way was an iron Howe truss of 150 feet span, built at Cleveland 11 years ago. It had been recently inspected and was believed to be in good order. The theory has been advanced that part of the train ran off the track just before reaching or while on the bridge, and that the resulting jar was the occasion, if not the cause, of the giving way, but the facts as known hardly seem to substantiate this, and it would not account for the breakage of a good bridge. An investigation is now in progress, which may develop further facts.

A preposterous charge was made that officers of the company prevented the Ashtabula fire department from throwing water on the wreck, and, though it was not substantiated, it has caused some little feeling. The chief of the fire department claimed that he could not connect his hose with his water supply. Probably many lives might have been saved by extinguishing the fire, or at any rate the bodies of the killed might have been recovered. Definite information of the character of the bridge has not yet been published. This is needed before any judgment can be passed on the occurrence.

Burlington, Cedar Rapids & Northern.

The Mayor of Burlington, Ia., having addressed a letter to this company complaining that contracts made with the city have not been fulfilled, General Winslow, the General Manager, replies, in substance, that the present owners are so unwillingly, and have taken the property only to prevent the entire loss of their interest; that they have suffered a much greater loss from the old company than the city has; that they believe the contract with the city has been substantially carried out; that they do not feel bound by the contracts of the old company, but nevertheless wish to have no controversy with the city which receives much of the business of the road, and are willing to confer with its representatives with a view to removing any substantial causes of complaint, if such there be.

Grand Trunk.

The trouble between this company and its enginemen culminated in a general strike on the evening of Dec. 29, when the men left their engines. The strike extended over the whole line, except the division from Island Pond to Portland, where the men continued at work. The trouble was further complicated by a heavy snow storm, which blocked a large part of the road, requiring extra power for such trains as were kept moving. Freight traffic was entirely stopped and only a few passenger trains were run where the company succeeded in getting a few men to work. Some violence was attempted by the men gathered at the division stations, who seized the round-houses and stopped trains, and a few of the men were arrested.

The trouble arose from the fact, as charged by the men, that recently the company has discharged a number of men, all of

whom belonged to the Brotherhood of Locomotive Engineers, and most of whom were old hands, receiving accordingly the highest rates of pay under the system in force on the road, while new men were retained at lower rates. The officers of the company charge that there has been unwarrantable interference with their management on the part of the Brotherhood, and claim also that the men discharged had been fairly selected.

Soon after the strike began negotiations were opened and continued for several days. The latest advices (Jan. 3) are to the effect that the men have consented to return to work, the rates of pay to be continued without change, and that traffic was resumed on the evening of that day.

Southern Minnesota.

Under a decree made by the United States Circuit Court for Minnesota, Dec. 27, 1876, being in modification of the decree of May 27, 1874, John Y. Page, Master in Chancery, will sell this road at public sale in St. Paul, Minn., Feb. 9, the sale including the entire road from the Mississippi River to Winnebago City, Minn., 167¼ miles, with all the shops, depots and other property, the equipment and the unsold portion of the land grant. The sale is in satisfaction of the equipment or second mortgage for $1,252,009, and will be made subject to the lien of the mortgage of 1864 for $225,000, and without prejudice to the rights of the holders of the $3,332,000 outstanding construction or first-mortgage bonds. Under the decree the equipment bondholders have the right to buy in the property on providing for the prior bonds.

Northern Pacific.

There is a report that this company has concluded arrangements for the extension of the road from Bismarck westward 205 miles to Glendive River in Montana Territory, and that work will be begun early in the spring.

Rome, Watertown & Ogdensburg.

This road has been divided into two divisions, the Rome, Watertown & Ogdensburg Division including the original road from Rome, N. Y., to Cape Vincent, Watertown and Potsdam, and the Lake Shore & Syracuse Division, which includes the line from Richland through Oswego to Lewiston and that from Syracuse to Sandy Creek. It is reported that new shops for the last named division are to be built at Oswego.

The Great Snow Storm.

A great snow storm marked the close of the old and the opening of the new year, extending all over the Middle States and Southern New England, and as far west as Ohio. Throughout this region there are reports of roads blocked, trains delayed, and of many minor accidents and delays caused by the snow. A peculiar feature of the storm was its great extension to the southward, the snow in Virginia being the heaviest on record for many years, the Chesapeake & Ohio road being badly blocked, and the Atlantic, Missi-sippi & Ohio reporting a number of freight trains stalled in the snow west of Lynchburg, a very unusual occurrence.

Jacksonville, Pensacola & Mobile.

This company having failed for more than twelve months to pay the interest on its bonds issued under the Florida law of 1869, the Governor of Florida gives notice that he has taken possession of the property and will cause it to be sold at public sale in Tallahassee, Fla., April 2. The sale will include the road from Lake City westward to the Apalachicola River, 150 miles, with the branches from Drifton to Monticello, 4 miles, and from Tallahassee to St. Marks, 20 miles, and will be made "subject to the vendor's lien held by the Board of Trustees of the Internal Improvement Fund of the State of Florida, for the unpaid purchase money due for said road."

Florida Central.

This company having failed to pay the interest on its bonds issued in exchange for Florida State bonds under the act of 1869, and the bondholders having demanded the enforcement of the lien, the Governor of Florida gives notice that he has taken possession of the road from Jacksonville to Lake City, 60 miles, and will cause it to be sold at public sale in Tallahassee, Fla., April 2, the sale to be for lawful money of the United States.

Galveston, Harrisburg & San Antonio.

The track on this road is laid to the Cibolo River, 14 miles westward from the late terminus at Santa Clara and 205 miles from Harrisburg. Two piers of the bridge over the Cibolo are completed, and it is intended to put up a temporary bridge so that construction trains can cross. If there is no delay in receiving the rails, it is expected that the track will reach San Antonio and the Cibolo bridge will be completed so that trains can run through by Feb. 1.

The Railway Postal Service Commission.

This Commission has resumed its work of collecting testimony and met in Boston Dec. 28, when a number of railroad officers made statements, and some of the Post Office officials were also examined. The general statement of the railroad officers who testified was that the pay received for carrying the mails was entirely too small for the service required and very much less than was received for express service of a similar character.

Pennsylvania.

The Philadelphia *Times* says:

"The Pennsylvania Railroad direction, at its regular meeting on the 27th ult., paid a just tribute to its many faithful employes. They recite the fact that the vast Centennial and regular passenger and freight traffic of the last year, the largest ever moved by any railway in this country, was accomplished 'with unprecedented freedom from accidents and delays, and without the loss of a single life, thus reflecting the highest credit upon the several operating departments of the company,' and very properly tender the thanks of the direction 'to all the officers and employees in the service of the company, for the faithful manner in which their respective duties have been discharged, and to which is to be attributed the highly satisfactory results attained during the Centennial year.' The General Manager was directed to transmit copies of the resolution 'to the officers and men engaged in the several departments of the company's service.' While such resolutions are only too often but formal observances of established custom, in this case the extraordinary facts upon which the commendation is predicated present a record that is, perhaps, exceptional in the history of railway operations."

Ogdensburg & Lake Champlain.

The New York Supreme Court has finally decided not to grant the petition of the Central Vermont Company for the discharge of the Receiver and the return of the road to its possession as lessee. The Receiver is continued in charge.

Western Counties.

Messrs. Shanley & Plunkett, the contractors, have discharged all their men, and have ordered a suspension of work until April 1.

Cleveland, Columbus, Cincinnati & Indianapolis.

The old shops in Indianapolis have been finally closed and all the machinery removed to the new shops at Brightwood, just outside the city. The new shops are very complete and include a round-house 240 feet in diameter; locomotive repair shop, 90 by 271 feet, with two wings, each 50 by 112 feet; boiler shop, 52 by 47 feet; foundry, 40 by 100 feet; car repair shop, 300 by 50 feet, with wing 250 by 50 feet; paint shop, 70 by 116 feet; blacksmith shop, 50 by 77 feet; car shed, 75 by 98 feet; store-house, 40 by 135 feet; oil house, 30 by 50 feet, and engine house, 37 by 25 feet. There are two transfer tables, one 30 by 300 feet for locomotives, and one 50 by 140 feet for cars. The buildings are all of brick with iron and slate roofs and are on a tract of 40 acres owned by the company.

Bachman Valley.

The surveys of three lines for the extension of this road from Chestnut Hill, Md., to a connection with the Western Maryland road have been completed, and the country along the line is being canvassed for stock subscriptions. The final location will depend somewhat upon the amount obtained on the line.

Longview & Texarkana Air Line.

A company by this name has been organized under the Texas general law to build a railroad from Longview, Tex., northeast to Texarkana, about 80 miles. The office of the company is at Atlanta, Texas.

Gulf, Colorado & Santa Fe.

The track of this road is completed to a point near Arcola, Tex., and 45 miles west from Galveston. But five miles more are to be built out of the 50 provided for by the Galveston subsidy.

Cincinnati, Rockport & Southwestern.

On application of several creditors the United States Circuit Court at Indianapolis has appointed D. C. Branham, of Madison, Ind., and W. O. Rockwood, of Indianapolis, Receiver. The application was made to preserve the property and to prevent the seizure of the equipment by creditors, a number of judgments having been obtained. The road is completed from Rockport, Ind., north by east to Ferdinand, 24 miles, and is partly finished to Jasper, 16 miles further.

Corpus Christi, San Diego & Rio Grande.

This company has completed the grading and bridging of a considerable section of its proposed road, and five miles of track have been laid from Corpus Christi, Tex., westward. A locomotive has been received and put upon the track; repair shops in Corpus Christi have been built, where several freight cars have been completed and others are in progress.

Wallkill Lime & Cement Company.

This company has just completed a narrow-gauge railroad about two miles long from its works at Hamburg, Sussex County, N. J., eastward to its limestone quarries in Hardiston township. It is a private road, intended only for the company's use in transporting limestone.

Utica & Ilion.

The organization of this company was completed at a meeting held in Utica, N. Y., Dec. 27. The capital stock was fixed at $130,000, and the gauge at 3 ft. It was stated at a meeting that a contractor offered to build and equip the road for $110,000. It is to run from Utica, N. Y., eastward to Ilion on the south side of the Erie Canal, a distance, as surveyed, of 11¼ miles, and is intended entirely for local business.

Atchison, Topeka & Santa Fe.

The Treasurer's report for November is as follows, 711 miles being worked for the month:

Gross earnings ($318 per mile)	$225,792 66
Working expenses (44.52 per cent)	100,528 56
Net earnings ($176 per mile)	$125,264 10

As compared with November, 1875, on 629 miles worked, there is an increase of 26.2 per cent. in gross and 31 per cent. in net earnings. For the eleven months ending Nov. 30, the earnings were $2,282,135.46 gross and $1,199,789.72 net, on an average of 696 miles, against $1,367,774.45 gross and $753,603.89 net in 1875 on an average of 535 miles.

Spring Hill & Pugwash.

Arrangements have been completed to organize a company by this name to build a railroad from the Intercolonial at River Philip, N. S., northward eight miles to Pugwash Harbor on Northumberland Straits. It will be an extension of the Spring Hill & Parrsboro road, now nearly completed.

Smyrna & Delaware Bay.

It is said that arrangements are being made to put this road in good order and work it regularly. It extends from Bombay Hook, Del., on Delaware Bay, westward to Massey's, Md., 16 miles, and was built in 1873, but only that portion from Massey's to Smyrna, 10 miles, has been worked, that section being used by the Kent County road.

Hoosac Tunnel Line.

The new track at Greenfield, Mass., on the State road, and the connection with the Fitchburg and the Connecticut River roads there are completed, but a good deal of filling is yet to be done in the Greenfield yard. Nearly all the work on the new location west of Greenfield is stopped for the winter.

Extensions of Mail Service.

Mail service has been ordered over the following old and new lines, to begin Jan. 1:

Long Island Railroad, Rockaway Branch, Valley Stream, N. Y., to Oceanus, 8 miles.

Delaware & Bound Brook and North Pennsylvania (New York & Philadelphia New Line), from Bound Brook, N. J., to Jenkintown, Pa., 47 miles.

Summit Branch, from Millersburg, Pa., to Williamstown, 19 miles.

Pennsylvania, Southwest Branch, from Southwest Junction, Pa., to Uniontown, 38 miles.

Dayton & Southeastern, from Xenia, O., to Washington Court House, 28½ miles.

Little Rock & Fort Smith, from Ozark, Ark., to Van Buren, 34 miles.

Erie.

The Reconstruction Trustees have extended the time for payment of the assessments on the stock under the plan of reorganization to March 1. After that time an addition of 10 per cent. on all assessments will be required.

The Receivers' report for September is as follows:

Cash on hand Sept. 1	$563,143 22
Receipts from all sources	1,912,048 86
Total	$2,475,192 08
Disbursements	2,066,248 99
Balance, Oct. 1	$408,943 09

The receipts include $182,976.48 from loans and certificates and the payments $460,000 on the same account. The amount of Receivers' certificates outstanding Oct. 1 was $952,976.48.

Indianapolis, Cincinnati & Lafayette.

The Receiver gives notice that the interest due Jan. 1 upon Cincinnati & Indiana bonds will be paid as usual at the company's office in New York.

Chicago, Burlington & Quincy.

Mr. John N. Denison, Assistant Treasurer, will receive at his office in Boston until Jan. 9 proposals for the sale to the trustees of Quincy & Warsaw bonds, funds to the amount of $163,471.14 being now applicable to the purchase of such bonds, under the provisions of the lease and contract between the two companies.

Philadelphia & Reading.

A second hearing was recently held before the Attorney-General and the Secretary of Internal Affairs of Pennsylvania on the question whether proceedings in the nature of a *quo warranto* should not be begun against this company and the Philadelphia & Reading Coal & Iron Company, for violation of charter. Decision was reserved.

Bangor & Calais Shore Line.

The work of locating this road is completed from Eastport, Me., westward to Whitneyville, but has been suspended in consequence of the severe weather and deep snow.

Boston, Clinton, Fitchburg & New Bedford.

A reduction of 10 per cent. in the pay of all employes has been made, the new rates of pay beginning Jan. 1.

Dividends.

Dividends have been declared by the following companies:

Beaver Branch (leased to St Louis & San Francisco), 2 per cent., quarterly, payable Jan. 15.

Woodruff Sleeping Car Co., 2 per cent., quarterly, payable Jan. 2.

Lake Shore & Michigan Southern, 1¼ per cent., semi-annual, payable Feb. 1.

Panama, 3 per cent., quarterly, payable Jan. 15.

Pittsburgh, Fort Wayne & Chicago, 1¾ per cent., quarterly, payable Jan. 2.

Chicago, Iowa & Nebraska (leased to Chicago & Northwestern), 5 per cent., payable Jan. 1.

Fitchburg, 3 per cent., semi-annual, payable Jan. 1.

Chicago & Alton.

This company some time since bought a branch track belonging to the Chicago & Wilmington Coal Company, and has since improved and extended it so as to form a branch from Braidwood, 57½ miles from Chicago, west by north to Coal City in Grundy County, about six miles. It also forms, in connection with the Chicago & Illinois River road, which is leased and worked as the Coal City Branch, a loop line from Braidwood to Joliet 27 miles long. This loop line is some seven miles longer than the main line, but is said to have lower grades, and coal trains are run by this line.

St. Louis, Keokuk & Northwestern.

The track on this road is laid to Clarksville, Mo., 10 miles southeast from the late terminus at Louisiana and 95 miles from the northern terminus at Keokuk. Regular trains were expected to run to Clarksville early this month.

Chicago, Iowa & Kansas.

A company by this name has been organized to build a railroad from a point on the Chicago & Northwestern, near Red Oak, Ia., southwest by way of Iowa City and Sigourney to Ottumwa, about 90 miles. For about half the distance there is an old graded road-bed which can be used. The company contemplates a future extension from Ottumwa to St. Joseph, Mo.

East River Bridge.

The bids received by the board of trustees for the steel wire for the main cables of this bridge were as follows; J. Roebling's Sons & Co., Trenton, N. J., two bids, one at 9 cents per pound and one at 6¾ cents, according to quality; J. Lloyd Haigh, New York, 8.7 cents per pound; Cleveland Rolling Mill Co., Cleveland, O., 8½ cents per pound; Washburn & Moen Manufacturing Co., Worcester, Mass., 13.95 cents per pound; Chrome Steel Co., Brooklyn, N. Y., 11⅞ cents per pound; Boecker & Co. Schalke, Westphalia, Germany, 9⅞ cents per pound; Richard Johnson & Nephew, Manchester, England, 13¼ cents per pound; W. T. Henley & Co., London, England, 6¼ pence sterling, delivered in Brooklyn, or £30 per ton free on board at London. No award has been made yet.

Calaveras.

There is talk of building a railroad from Ione City, Cal., the terminus of the lately completed Ione Branch of the Central Pacific, into the foot hills of Calaveras County. The road would open a fine farming country and would also reach the largest deposits of iron ore on the Pacific coast. It is claimed that the coal from the new mines at Ione is well adapted for smelting iron and that the extension would make it possible to manufacture iron at a very small cost.

Billerica & Bedford.

The town of Billerica, Mass., has voted to subscribe $12,000 to the stock of this company, which is building a railroad of 24 in. gauge and about seven miles long from North Billerica to Bedford Station on the Middlesex Central road.

Tyler Tap.

Iron has been bought for this road and the first lot will be delivered this month at Big Sandy, Tex., on the Texas & Pacific road, when tracklaying will be begun from that point towards Tyler.

Belleville & Southern Illinois.

Franklin County, Ill., has voted to subscribe $150,000 in aid of an extension of this road from Duquoin, Ill., east by south to Shawneetown, about 65 miles. Other counties on the line are to vote soon on the same question.

Western Maryland.

At the last meeting of the board it was resolved to issue no more free passes over the road. A reduction was ordered of 25 per cent. on yearly commutation tickets. The Finance Committee was ordered to pay the coupons on the first-mortgage bonds which became due Jan. 1, 1877, and those on the second-preferred bonds which became due Jan. 1, 1874.

Paulinskill Valley.

The grading of this road is nearly all done from Blairstown, N. J., to the Delaware, Lackawanna & Western at Delaware Station, and the contractor began to lay the rails last week.

Cincinnati, Indiana & Illinois Midland.

A company by this name proposes to build a new line from Cincinnati by way of Greenburg, Edinburg and Brazil, Ind., to Paris, Ill., to connect with the Illinois Midland at the last-named place. Dr. Hervey, late President of the Illinois Midland, is said to be working up the project.

Central Vermont.

This company has given notice of a reduction in wages varying from 10 to 16⅔ per cent., which was to take effect Jan. 1.

Atlantic & Great Western.

The Court of Common Pleas of Summit County, O., has granted the motion of Taylor and Dunphy, trustees, to confirm a contract providing for delay in enforcing the claims of the holders of what are commonly known as the Ohio bonds, the principal of which became due Oct. 1, 1876. The contract provides for the payment of interest on the bonds during the delay. The amount of these bonds outstanding is $2,416,300, and they are a first lien on the road in Ohio.

Valley, of Virginia.

At a special meeting of the stockholders in Staunton, Va., Dec. 28, the action of the directors upon the propositions submitted by the National Improvement Company and the Shenandoah Valley Company were approved. A proposition was made by Mason, Shanahan & Co. to build the road, but after consultation this was rejected. A proposition was made to lease to the Shenandoah Valley Company by the month, with an option to retain it against all bidders on equal terms. A substitute for this was finally adopted, instructing the board to lease by the month, at a rate not less than $2,000; second, to give a refusal to the company leasing in case of other bids; third, in case the Valley Company should resume the control of

the road to operate it, the Shenandoah Valley Company to have a guarantee of equal connecting facilities and privileges with those of any other road at Harrisonburg.

Colorado Central.

In the suit of Ames and others against this company a motion was lately made by the plaintiffs to remove the case to the United States Circuit Court and for a writ of assistance to install the Receiver appointed last summer. The Court refused the motion, holding that the case must remain with the local court, which was, when the suit was begun, a territorial court, but is now provisionally a court of the State of Colorado, and that there was no sufficient ground for the Federal court to assume jurisdiction.

Indianola & Chariton.

There is talk of building a railroad from Indianola, Ia., the terminus of a branch of the Rock Island road, south by east to Chariton, on the Chicago, Burlington & Quincy. The distance is about 28 miles.

Grand Southern.

About 60 miles of this road are now graded, and the work has been pronounced good by the Government engineer. A contract has been let for the ties for the section from St. Stephen, N. B., to St. George.

Fort Madison & Northwestern.

A contract for the construction of this projected road has been let to a company organized for the purpose and known as the Joliet Railroad Construction Company. The contract is conditional on the raising of a certain amount of subsidies along the line.

Keokuk, Iowa City & Minnesota.

The Keokuk & Minnesota Construction Company has brought suit against this company to recover $103,269 for work done, and also to enforce a mechanic's lien on the graded road in Lee County, Ia.

Montpelier & Wells River.

Under the decree of foreclosure lately granted the time allowed for redemption expired Jan. 1. It is understood that the property will be transferred to the bondholders and that they will at once organize a new company.

New London Northern.

The claim of Dawson, Tank & Co., contractors, for about $50,000 for extra work on this company's new wharf at New London, Conn., has been referred by mutual consent to three arbitrators, who are now taking testimony in the matter.

Worcester Union Depot.

The viaduct over which the Southern roads, the Norwich & Worcester and the Providence & Worcester, are to run to the new Union depot in Worcester, Mass., is completed and nearly all the connections are made. It is expected that everything will be completed this week. The Boston & Albany and the Northern roads have been using the depot for some time.

Somerset.

At a recent meeting of the board a proposition was received from parties in Augusta, Me., who offer to build a line from Augusta to West Waterville, the southern terminus of the Somerset road, provided the gauge of that road is changed to 3 ft. No final action was taken. The distance from Augusta to West Waterville is 18 miles, and a line was surveyed some time ago.

Mobile & Ohio.

The objections filed by certain holders of the first and second-mortgage bonds to the allowance of the so-called Tennessee substitution bonds as a lien upon the property have been referred by the United States Circuit Court to James Gillette as Special Master. Mr. Gillette gives notice that he will proceed to take testimony at the court room in Mobile, Ala., Jan. 22, and all parties interested are notified to appear accordingly.

Kansas City, Memphis & Mobile.

The graded road-bed and other property of this company was recently sold in bankruptcy for $1,100 to a former contractor, but the assignees filed objections and the Court refused to confirm the sale unless the purchaser would agree to complete the road. This he declined to do, and an effort is to be made to organize a company to buy the property and complete the road. The grading is partly done for some 90 miles from Kansas City, Mo., southeastward.

George's Creek & Cumberland.

A company by this name has filed its articles of incorporation in Maryland. The road to be built is from the Chesapeake & Ohio Canal at Cumberland west and southwest into the Cumberland coal fields.

Wabash.

The books of subscription to the capital stock were closed Dec. 23, and it is stated that holders of about $15,000,000 out of $16,000,000 of the old Toledo, Wabash & Western stock have decided to pay the assessment of $10 per share and take stock in the new company. The new company will have $16,000,000 common stock and about $19,600,000 bonded debt, the stock being about $26,667 and the bonds $32,667 per mile. The transfer of the road to the new company is expected to be made during the present month.

Columbus, Chicago & Indiana Central.

The trustees give notice that the coupons on Columbus & Indianapolis Central first-mortgage bonds which became due July 1, 1876, will be paid on presentation to A. Iselin & Co., No. 48 Wall street, New York.

In the United States Circuit Court at Indianapolis the trustees and receivers have begun a suit against the Pennsylvania Railroad Company as guarantor of the lease to the Pittsburgh, Cincinnati & St. Louis Company. That company having failed to fulfill the conditions of the lease, it is now sought to enforce the guarantee given by the Pennsylvania.

St. Joseph & Northeastern.

At a public meeting held recently in St. Joseph, Mo., it was resolved to organize a company to build a narrow-gauge road from that city northeast to Albany, about 50 miles. It is proposed to extend the road further to some point in Iowa after it is finished to Albany. It is claimed that the 50 miles to Albany can be built and equipped for $350,000, or $7,000 per mile.

Lake Shore & Michigan Southern.

At a meeting of the board in New York, Dec. 29, the following statement was presented for the year 1876, the December business being in part estimated :

Gross earnings	$13,963,177
Working expenses (68.57 per cent.)	9,602,000
Net earnings	$4,361,177
Interest, rents and dividends on guaranteed stock	2,750,000
Surplus	$1,611,177
Dividend of Aug. 1, 2 per cent.	989,330
Balance	$621,847

During the year about 10,500 tons of steel rails have been substituted for iron. The cost of substitution was paid out of current revenue, and is included in the amount of expenses above stated. The company has no floating debt nor outstanding obligations in that nature. During the year the bonded debt has been reduced $250,000 by the fulfillment of the requirement of the sinking fund, and now stands at an aggregate of $36,000,000. The road, machinery and property have been in all respects fully maintained at their high standard condition, and in many respects materially improved.

On this showing the board resolved to declare a dividend of 1¼ per cent. for the last six months, making 3¼ per cent. for the year.

Missouri, Kansas & Texas.

Mr. Wm. Bond, General Manager, makes the following statement for the four months from July 1 to Oct. 30, 1876 :

Freight earnings	$818,065
Passengers	294,003
Express, mail, etc.	66,016
Total ($1,499 per mile)	$1,178,084
Working expenses (57.90 per cent.)	682,080
Net earnings ($631 per mile)	$496,004

Renewals are included in working expenses; they amounted to $87,902 for the four months.

The Union Trust Company, trustee, gives notice that it will pay at its office in New York $20, gold, on coupons of Union Pacific, Southern Branch bonds maturing Jan. 1, 1877, which have been stamped as subject to the agreement of March 1, 1876.

Peoria & Rock Island.

In the United States Circuit Court in Chicago last week argument was heard on the final decree of foreclosure and sale and also on the cross-bill filed by the Coal Valley Mining Company, which claims certain rights in the road from Coal Valley to Rock Island. The Court decided that its claims were valid; it also decided to grant the decree of foreclosure, but the terms of the decree are not yet settled.

Wheeling & Lake Erie.

A meeting of the directors was to be held at Orrville, O., Jan. 3, to conclude arrangements for the completion of the road.

P. J. Keegan & Co., who have the contract for the completion of the line from the crossing of the Pan Handle Line to the Ohio River at Martin's ferry, have now over 150 men at work. On this section there are six tunnels, one of which is done and work is in progress on the others, Maxwell's, 1,800 feet long; Copeland's, 1,000 feet long; Ireland's, 300 feet long; Pine Hill, 550 feet long, and Asa's, 350 feet long. The approaches to Maxwell's, Copeland's and Ireland's tunnels are also nearly done.

Louisville, Cincinnati & Lexington.

The Auditor's report for November is as follows:

	1876.	1875.	1874.
Passenger earnings	$30,811 07	$38,482 62	$3 ,370 65
Freight	52,538 96	58,584 65	60,220 57
Mail, express, etc.	6,908 50	6,812 02	5,501 34
Total earnings	$90,258 53	$103,879 29	$103,092 56
Expenses and renewals	60,816 71	65,366 29	86,477 67
Net earnings	$29,441 82	$38,513 00	$16,614 89
Taxes, rentals and construction	2,705 66	4,705 14	7,167 87
Net profit	$26,736 16	$33,807 86	$9,447 02
Per cent. of expenses	67,35	62.91	83.88

As compared with 1875 there is a decrease this year of $13,620.76, or 13.1 per cent., in gross earnings; of $9,071.18, or 23.6 per cent., in net earnings, and of $7,071.70, or 20.9 per cent., in net profits. The gross earnings this year are $391.49 per mile.

St. Louis & San Francisco.

This company will pay at the office of Trask & Stone, No. 7 New street, New York, on presentation, the fifty Atlantic & Pacific land debenture bonds drawn for redemption under the terms of the mortgage. The numbers drawn are: 18, 27, 31, 42, 46, 50, 55, 63, 65, 91, 122, 132, 138, 165, 166, 186, 189, 193, 196, 203, 220, 221, 269, 270, 273, 275, 281, 285, 286, 288, 295, 296, 297, 305, 310, 328, 340, 352, 357, 359, 372, 391, 418, 420, 456, 461, 465, 472, 475, 488.

Gilbert Elevated.

The New York Supreme Court, at General Term, has given a decision sustaining this company's right to build its proposed road. The decision was on an application for commissioners to condemn for the use of the road a portion of South Fifth avenue, in New York, the title to which is not in the city but in the holders of adjoining lands. The court sets aside the objections made and grants the order for the appointment of the commissioners. The case will probably be taken to the Court of Appeals.

Southern Pacific.

Work is progressing very rapidly on the cross-line from Goshen, Cal., westward toward Hollister, and the section of 50 miles from Goshen to Los Gatos, most of which is light work, is to be finished in a short time. As soon as this work is done the grading force will be sent to Indian Wells to work on the extension to Fort Yuma. That also is very light work, there being hardly any grading required over the level and sandy desert.

Report of the British Railway Commission.

We give below the larger part of the last report of the Railway Commissioners of Great Britain, who, as will be seen, form a court of special jurisdiction. The report will show the class of questions with which the Commissioners deal. Many of them arise frequently in railroad practice in this country, and the decisions will be interesting to railroad men generally :

May it please Your Majesty:

1. We, the Railway Commissioners, have the honor to lay before your Majesty our third annual report.

2. A principal object of the Regulation of Railways act, 1873, was to facilitate recourse to the Railway and Canal Traffic act, 1854, the second section of which enjoined railway companies to afford all reasonable facilities for the receiving, forwarding and delivering of traffic, and to make no unfair distinction between their customers. It is but a small part of the duties of railway companies not to put impediments in the way of freedom of traffic; nevertheless, that part is all that the law of injunctions applies to. The injunction is a remedy against undue preferences, or unreasonable modes of conditions of carriage; but it does not entertain complaints, of which the ground is, for example, omission to take precautions against accidents, or to provide adequately for the safety of traffic entrusted to the care of railway companies. Nor did the act of 1873 alter the earlier act in that respect; it simply amended the mode of carrying it out. It substituted a special court of three Commissioners for the judges of the superior courts, on whom the duty was originally imposed, and it was hoped that the manner in which the new tribunal would investigate complaints would cause many more applications than before to be made to enforce the act where there were infringements of its provisions. So far the change does seem to have had the effect anticipated, for there have been as many applications under the Railway and Canal Traffic act, 1854, sec. 2, in the three years since September, 1873, as there were between 1854 and that date. In the past year the number, excluding cases not yet heard, has been eleven, and we will commence our report with a summary and analysis of their chief points, having, however, to observe that they were not all left for our decision, some being unopposed or settled by agreement.

Gwendraeth Valleys *v.* Burry Port & Gwendraeth Valley, Evershed and others *v.* London & Northwestern, Horbury Bridge Coal, Iron & Wagon Company *v.* Lancashire & Yorkshire, and Jackman *v.* Isle of Wight were four cases of that class.

The facts of the first case were briefly these. The railway of the Gwendraeth Valleys commences by a junction with the South Wales near Kidwelly, and at Tycock, a short distance from Kidwelly, it has a junction also with a branch of the Burry Port. Traffic to and from collieries on the Burry Port and to and from works on the Gwendraeth Valleys, and a proportion of traffic going west from the Burry Port by the South Wales, would, if sent by the shortest route, be sent by the Tycock Junction. The complaint which the Gwendraeth Valleys made to us was that the Burry Port would not properly use that route, and that they diverted traffic from it to another route more circuitous, but in which they were more interested, and that finally they had cut the through communication by taking up the points at the junction. The case was partly heard before it terminated. The heads of agreement were that the Tycock Junction should be restored, and that the Gwendraeth Valleys should in future work the branch line for the Burry Port, each company promising fair treatment for through traffic. Half the costs of the application were ordered by us to be paid by the Burry Port, as we considered that they should not have taken up the junction lines.

3. In Evershed and others *v.* London & Northwestern, the respondents were charged with allowing brewers at Burton, who loaded and unloaded in their own works and at their own expense, a rebate more than commensurate with the value of the porterage saved to the company, to the undue prejudice of brewers who, like the complainants, employed the company as their carriers to unload and load in the usual way. The case was similar to Bell *v.* London & Northwestern, which we mentioned in our second report, and where we decided that the rebate was excessive, and that so long as the company allowed it they must return to Bell, off the rates at which they carried his goods, the amount per ton at which the rebate was more per ton than it should have been according to the reasonable cost of the service; and guided by the principle there established, the company offered the same terms to Evershed and the others. The offer when the case came on for hearing was accepted. We allowed the complainants their costs.

4. Jackman *v.* Isle of Wight was a case of vehicles plying for hire in competition, and of the railway company giving one of them an undue advantage, the vehicle of the complainants being excluded from the station-yard at Ventnor, while that of another coach proprietor was admitted. There was no answer to the application, and the case was disposed of by agreement, the company paying costs.

5. Horbury Wagon Company *v.* Lancashire & Yorkshire illustrated the indirect use of the Commission in bringing about agreements, the alternative to an amicable settlement being a resort to the Commissioners at the option of either side. The premises of the Horbury were close to the Horbury and Osset station of the Lancashire & Yorkshire, and a siding to connect them with the railway was necessary to the business of the wagon works. But there were points in regard to the proposed siding about which the wagon company and the railway company could not agree, and eighteen months passed in negotiating and exchanging plans. The wagon company then complained to us that the railway company were not willing to give them as good siding accommodation as they gave to others in like circumstances, nor to afford them reasonable facilities for their traffic. The case ended at the hearing by the parties in court coming to terms, the railway company agreeing to grant the connection which the applicants desired, upon the latter undertaking to make another and additional connection at a different point, should the traffic from the works, in the opinion of the railway company, eventually require it.

6. We will now shortly state the cases under the act of 1854 in which we gave decisions. In Holland and another *v.* Festiniog Railway Company (No. 6 in Appendix, p. 13) an injunction was sought on the ground that the railway company carried slate for the Welsh Slate Company at a lower rate per ton than they charged the complainants. Both the Welsh Slate Company and the complainants were among several quarry-owners with whom in 1864 the railway company had entered into an agreement by which a quarry-owner who agreed to send all his slates by the line of the railway company for the next fourteen years was to have his goods carried for 2s. 6d. a ton. In 1871 the railway company and the Welsh Slate Company made a fresh agreement, by which, in consideration of the Welsh Company engaging to use no other means of conveyance for their slate for a new term of thirty years, the 2s. 6d. rate by the Festiniog was reduced in their case to 2s. 1½d. A similar agreement was offered to the complainants, but declined. We held, first, that the extension of time granted by the Welsh Slate Company did not justify the difference of charge in their favor; and, secondly, that the agreement of 1864 meant that all who signed it should during its continuance have equal treatment, and in particular, as far as rates of charge were concerned, should not any of them be given a preference over the others. And we directed an injunction to be issued.

7. Greenop and others *v.* Southeastern was another case of undue preference. The applicants were Custom-house agents at Folkestone, and their complaint was that the railway company charged them higher rates on goods shipped from Boulogne for London via Folkestone and cleared by them through the Custom-house than they charged Messrs. Flageolet Freres for shipments of a similar kind. It was admitted that Flageolet Freres were allowed a rebate of 15 per cent. besides other advantages; but it appeared that in return for this reduction off the tariff rates they were under a guarantee to send between Boulogne and London, by the Southeastern steamboats and railway, 850 tons each month, dating from 1st January, 1867. The guarantee had not the effect of causing the goods forwarded under it to be carried at any less cost to the company than the goods of others, but the company acquired it because as carriers between Boulogne and London they had to maintain a competition with the Thames Steam Navigation Company, and this circumstance, with this in addition, that the applicants and any person could, by guaranteeing traffic of whatever amount, obtain a diminution of the tariff proportionate to the quantity for which the customer made himself responsible, justified, we thought, the course taken by the company, and the application, therefore, was refused.

8. In the last case the company had steamboat powers, and the act of 1854 was not less applicable to their traffic at sea than on land. Another act, 31 and 32 Vic., c. 119, sec. 16, further provides that a railway company with those powers shall make no distinctions between railway passengers and others using their steamboats, but shall charge equal tolls to all alike, and that if the company through-book persons using both modes of transit, the tickets they issue shall show how much of the aggregate fare is for the steamboat and how much for the railway. These enactments apply only to railway companies authorized to acquire or use steam vessels, but we think they might well be extended to the traffic on board vessels which are worked by their owners in conjunction with a railway under traffic arrangements with a railway company. In the Southsea & Isle of Wight Steam Ferry *v.* London & Southwestern and London, Brighton & South Coast (No. 15 in Appendix, p. 35), the railway companies booked through to and from Ryde via their joint station at Portsmouth by the vessels of the Portsmouth & Ryde Steam Packet, but refused to have a correspond-

ing arrangement with the ferry company, on the ground that their vessels were inferior to those of the packet company, and unequal to the requirements of a railway through traffic. The ferry company complained of this as an undue preference of one company over the other; but as the objections made to the vessels were supported by the evidence, and the responsibility of a railway company through-booking does not end with its own part of the through route, we do not think that an undue preference was shown to exist. The ferry company also complained that the tickets issued did not distinguish the sea portion of the through fare, and that the packet company did not impose their rates equally, as they carried local passengers, being the description of traffic for which they had to compete with the ferry company, for less than their railway passengers. But these points could not be brought within the prohibition of a statute which, as we have stated, applies only to vessels used by railway companies, and we were unable therefore to interfere in regard to them.

9. Robertson, trading under the name of Fishbourne & Co., *v.* Great Southern & Western, Ireland, and the same *v.* Midland Great Western of Ireland, were two carriers' cases. The complaint against the Great Southern & Western was that they would not allow to the complainant off their parcels rates, which included collection in Dublin, on parcels he conveyed to their terminus, as much as they allowed to their own carting agent. There was no doubt that the company had been making a difference of that kind to the undue prejudice of the complainant, but they were able to show at the hearing that the difference had already been put an end to, and that they were then paying their agent for collection no more than they allowed to the complainant. An injunction therefore was not needed, but we made an order on the company to state in their notices to the public the particular sum included in their parcels rates for collection, such sum not being payable to the company where they were not employed to collect.

10. In the other case, that against the Midland Great Western, collection in Dublin was included in the parcels rates of that company also, and parcels under 21 pounds were carried any distance on their railway if prepaid by having affixed to them stamps according to weight, which were sold by the company at very reduced rates. The service of collecting parcels, stamped and unstamped, was performed for the company by a carting agent for a payment of one penny per unstamped parcel, and the company made this arrangement the measure of their allowance to those who carted their own parcels. The applicant, however, claimed to receive the same allowance on stamped as on unstamped parcels, and contended that otherwise he was unduly prejudiced and overcharged in respect of stamped parcels. We, however, thought that the company succeeded in showing that they neither made a charge to the public nor an allowance to their agent for the conveyance of stamped parcels to the railway, and we decided therefore not to interpose under the act.

11. In the Corporation of Reigate *v.* the Brighton and the South Eastern the application was to compel the two companies to provide not less adequately for the railway requirements of Reigate than they did for those of other places on their lines which competed with Reigate in offering attractions for the residence of persons who wished to live somewhere in in the country where they would be within reach of London for their daily business. It was an undue preference, it was urged, of such places as against Reigate, that Reigate was denied the accommodation offered to them, as also to many places on the lines of two companies, of joint return tickets without extra charge, entitling the holders to the use of the trains and of the metropolitan termini of either company; and it was also complained that a difference was made between Reigate and other places, to the disadvantage of the borough, in the rates of charge per mile for season tickets to London. The application was made with the approval of the Board of Trade, as required for a complaint of a municipal corporation, but it was ultimately discharged by our order at the instance of the applicants, each side paying its own costs.

12. The act of 1854 enjoined every railway company to forward traffic with all reasonable facilities. These facilities were declared by the act of 1873 to include forwarding at through rates from or to other lines at the request of a railway company, and it was at the same time provided that a forwarding company might object to the proposed through rates, and that the Commissioners should then decide whether they should be allowed or not. We stated last year that we had granted through rates under this section in a case of the East & West Junction *v.* the Great Western, which was an application for through rates for Northamptonshire iron ore from the Blisworth district to South Wales *via* the Great Western and Monmouthshire. Another case between the same parties came before us this year, in which through rates for the same traffic to South Wales *via* the Great Western and the Northwestern or Midland were applied for, and the granting of them opposed by the Great Western. It was arranged, however, during the hearing, that the through rates should be allowed, subject to an apportionment as between the two companies, which gave the Great Western 0.50 of a penny per ton per mile for ironstone to any place in South Wales carried by the Great Western from the Junction line, and 0.55 if the total traffic was under 1,000 tons a week, and a further 0.5 per centum as to so much of it as should pass off the Great Western on to a foreign line before reaching Abergavenny. This arrangement was to be terminable by either company at short notice, but while it lasted was to apply to the apportionment of receipts from traffic to the places in South Wales mentioned in our order of 1875, and we made an order embodying this arrangement and modifying during its continuance the order in the previous case.

13. Greenock & Wemyss Bay *v.* Caledonian was another case, mentioned in our second report, in which we granted through rates, and the case was an application by the Caledonian for leave to appeal upon points of law from that decision. Some of the points were not, in our opinion, matters for appeal, but others raised questions which were questions of law- viz., first, whether a railway company which owned but did not work a line could apply for through rates under sec. 11 of the act of 1873; and next, whether steamboat traffic between Wemyss Bay and Incilan, and other places on the Clyde, was, as we had held it to be, within that section; and upon those we granted an appeal, and stated a case in writing for the opinion of the Court of Session in Scotland.

14. The cases we have next to mention relate to differences between railway companies which under any general or special act might have been referred to arbitration. Such differences, under sec. 8 of the act of 1873, may be referred to us for decision at the instance of any of the parties to them, and it will be evident that considerable use is made of this right to compel a reference; but its exercise is at present restricted to questions which might be settled by arbitration, and we think if a freer course were opened to it, the benefit it is would be increased in proportion. We have also the power, under sec. 9, with consent, to decide differences of any kind, and between any parties, provided one of the parties is a railway company. The number of cases under these sections 8 and 9 which we decided during the year was fourteen, of which two were heard at the joint request of both sides.

15. The Isle of Wight (Newport Junction) *v.* Ryde & Newport, and Ryde & Newport *v.* Isle of Wight, were cross references of differences between the two companies. Their railways out of Newport starting from the same station, and for a short distance running side by side, a single company it was thought would best construct the works at Newport for both. Each, therefore, of their special acts provided that the joint stations and a certain length of each line should be constructed in such manner and upon such terms as an arbitrator should determine. The determination so made was, that they should be constructed by the Ryde & Newport according to plans annexed to the award, and that the cost should be defrayed by the two companies in equal shares. The contentions before us were, on the part of the Isle of Wight, that the works executed by the Ryde & Newport were not according to the plans, and in particular that the distance for which the two lines were to be constructed at the joint and equal cost of both companies was longer than the Ryde & Newport would allow; and on the the part of the Ryde & Newport, that the award intended that there should be a concurrent payment by the two companies of the cost of the works as they proceeded, and that the Isle of Wight were not justified in refusing, as they did, to pay by installments, or until the works should be all completed. The decision we gave will be found in the Appendix, p. 9.

16. In the Caledonian *v.* North British, No. 1, the act for the amalgamation of the Scottish Central with the Caledonian system gave power to the North British to fix the rates for Scottish east coast traffic, as it was called, or traffic passing partly over the Scottish Central, and partly over the North British, the receipts to be divided by mileage, but minimum sums per mile to be allowed to the Caledonian. The issue of season and traders' tickets had been determined by arbitration to be within the power thus given to the North British, and the questions referred to us for decision, and upon which we gave judgment, were, first, how the receipts from these tickets were to be apportioned between the two companies; and secondly, what should be the qualifying traffic in respect of which the North British might issue a trader's ticket.

17. A bill was brought in last session to authorize the Caledonian to construct a number of new lines, and was opposed by the North British. Part of an existing agreement between the two companies was as follows: "Each company shall be at liberty to apply to Parliament for power to construct lines in its own district for the accommodation of the local traffic in such district; but neither company shall directly or indirectly promote or support any new line in the district of the other." And one of the objections of the North British being founded on this agreement, what its signification was, and whether the bill in whole or in part was at variance with it, were the matters referred to us in Caledonian *v.* North British, No. 2. There was no doubt as to the parties having agreed that neither should promote a new line in the district of the other, nor be opposed by the other in applying for power to construct new lines in its own district for local traffic. But, did the agreement leave it open to each company to make applications, that the other might oppose, for new lines in its own district, not confined to local traffic, or for new lines for any purposes in those districts of which both companies were equally in possession, and which could not properly be called the district of either in particular? These questions could, in our opinion, be answered only in the affirmative, and having then proceeded to examine the course of each of the proposed lines, we came to the conclusion that the bill was not inconsistent with the agreement.

18. The suitability of a locomotive engine was the question for decision in the East & West Junction *v.* Northampton & Banbury. The Junction Company had running powers over the line of the respondents into Blisworth, and worked their goods traffic with a Fairlie engine. The Railway Clauses act, 1845, sec. 115, authorizes the settlement by arbitration of differences between a company and the owner of an engine as to its fitness to be used on their railway, and the Fairlie engine was objected to by the respondents on the ground that its great width unfitted it for their railway. We decided that except where less than a space of 6 ft. had been allowed between the sidings in the station yard at Blisworth the engine was not unfit to be used.

19. The undertaking of the Carnarvonshire was vested in the London & Northwestern in 1870. One effect of this transfer was that Afonwen, near Carnarvon, became a place at which traffic could pass direct to the Northwestern from the lines of the Cambrian. And where the Northwestern receive traffic other than minerals from a Cambrian railway, and there is no other and shorter route, they have to pay 50 per cent. of their own mileage receipts upon such traffic to the Cambrian in return for having running powers over that company's lines. Before 1870, the two systems were not in connection at any point on the coast side, but only at places inland, as Whitchurch, and the Northwestern refused to extend the payment of the 50 per cent. rebate to traffic passed to them at Afonwen, on the ground that the act of 1870, which vested in them the railway of the Carnarvonshire, took from them at the same time all right to use the Cambrian railways from the direction of Afonwen, and thus divested them at that end of the Cambrian system of what was their consideration for the payment of the rebate. The matter in difference was referred to us, and we decided (Cambrian *v.* London & Northwestern) that the act of 1870 did not operate in the manner supposed by the Northwestern, and that they were bound to pay the rebate on traffic transferred to them at Afonwen.

20. The Midland *v.* Great Western was another case of difference as to the meaning of an agreement. The Midland were proposing, in conjunction with the Southwestern, to lease and work the Somerset & Dorset, and were met by the Great Western with the objection that they were not at liberty to do so, the district of the Somerset & Dorset being south of Bath and Bristol, and Bath and Bristol being the agreed termini, north and south respectively, of the Great Western and Midland. The agreement bore date 17th March, 1863, and had been confirmed by Parliament, and articles 18 and 19 were those on which the Great Western particularly relied as drawing a line, of which each company was to keep to its own side for all time to come. We were, however, of opinion that the articles were not of this comprehensive character, and that, in fact, they merely embodied the principle of an arrangement which had been come to for the giving up by the Midland of the greater part of a bill which they had brought in, and were at the time endeavoring to get passed. And we held that, read as they should be with reference to that special purpose, obscurely worded though they might be, they did not prevent the Midland from taking a lease of the Somerset & Dorset.

21. The Harborne *v.* London & Northwestern was a dispute as to whether the mode in which the respondents worked the Harborne satisfied the requirements of a working agreement. The railway, according to the agreement, was to be worked so as properly to develop and accommodate both the through and the local traffic of the district, and the Harborne complained that the service was not of that kind, and that the times of the passenger trains, and the rates and arrangements for goods traffic, were such that the public preferred to go by omnibus, and to cart their goods by the road. As the road was shorter than the railway, and the distance each way three or four miles only, it was not to be expected that the railway would altogether supersede other modes of transit; but the complaints of the Harborne were, in the main, we thought, well founded, and we ordered the service to be improved in certain respects as indicated by them. They further complained of not receiving the share of the receipts or earnings of their line to which they were entitled by the agreement, the Northwestern deducting terminals before division, and retaining them, whereas, in the opinion of the Harborne, the allowance for terminal expenses should have been included in the balance for division. And we decided that their principle of division was the right one.

22. Torbay & Brixham *v.* South Devon was also about terminals. The South Devon were the agents of the Brixham for working and managing their line, collecting its receipts, and, after paying all expenses, accounting to them for the balance. The line formed a short branch from the Churston station of the South Devon to Brixham, and its traffic was almost wholly to and from places beyond Churston Junction; and according to railway practice, where traffic is carried by two or more companies, the company at each end of the through route has an allowance for terminal expenses out of the gross rate, and only the remainder of the rate is for conveyance and for division by mileage among the different companies interested. The Brixham accordingly claimed that the terminals allowed to the South Devon in the division of the receipts from traffic to or from Brixham should be placed to the credit of the Brixham, and also that on traffic between Brixham and South Devon stations the gross rate should be divided in the same way, as regards terminals, as if the Brixham line and the South Devon line had been worked by separate companies. The reply of the South Devon was that they worked the Brixham line at fixed rates of tolls, which the Brixham elected to take in lieu of mileage and terminals, and that the Brixham, being credited with the full amount of their local rate deducted before division from the gross rate, had nothing to do with the manner in which the gross rate was afterwards divided between the South Devon and other companies. But, besides that, the Brixham did not appear to have fixed the local rates with any reference to terminal expenses, nor, indeed, at the time, to have known of the regulations of railway companies for dividing the receipts from through traffic: they had been advised in what they had done by the South Devon, and as that company were their agents for working the line, the standing of the South Devon in that situation of confidence was, we thought, a reason why they should not reap any benefit at the expense of their principals, through failure to advise them as to the best method of charging for traffic on the line. We, therefore, upheld in the main the view taken by the Brixham, and ordered the past accounts between the two companies to be corrected.

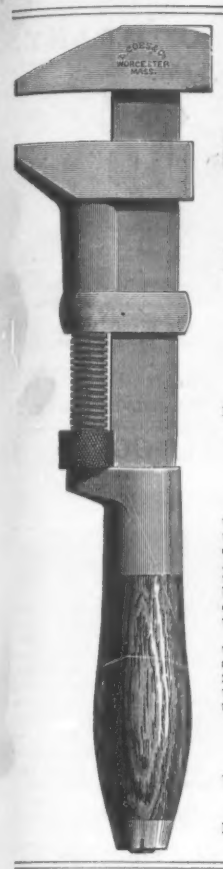
23. As arbitrators under the Cheshire Lines Transfer act, 1865, we decided, on an application of the Manchester, Sheffield & Lincolnshire, and Midland *v.* Great Northern, a difference that had risen between the members of the committee managing the lines and representing those three companies, on the subject of a plan for the roof of the Manchester central station. It appeared to the Great Northern that if the station was to be large enough to accommodate not only the local traffic of the Cheshire lines, but the through traffic of the three companies as well, it would be fair, as the Great Northern would not require to use it for their through traffic, that the cost should be separated, and only so much of it as was needed to provide station accommodation for the local traffic paid by the three companies in equal proportions, the rest being charged to the company which should use the station for its through traffic. But the act which vested the Cheshire lines in the three companies gave to each the right to use them as if they formed part of their own undertaking, and equally for through as for local traffic. We held, therefore, that a third of the entire cost was on any plan of the station chargeable to each company, and as it was not argued that the plan for a roof advocated by the Sheffield and Midland was too large for the probable traffic of every kind, we approved of its adoption.

24. Midland *v.* Neath & Brecon came before us under the Midland (Swansea Vale Lease) act, 1874, which gave the Midland absolute running powers over 29 miles of the Neath & Brecon, and enacted that the Railway Commissioners should settle the amount to be paid for such powers. The circumstances were in some respects of a special character, and we decided that the payment to the Neath & Brecon should be the proportion of net receipts due to their mileage, with 5 per cent. added thereto, and we fixed the allowance to the Midland for working expenses at 40 per cent. of the gross receipts less terminals, such allowance with reference to the line being one of steep inclines, to be liable to revision after one year's further experience of the cost of working.

25. In the Caledonian *v.* Great Northern, Northeastern, and North British, the North British from Edinburgh to Larbert, and the Caledonian from Larbert to Perth and Aberdeen, being continuous to the railways from London and York, the Great Northern and the Northeastern had a statutory right, if they ran trains expressly for the accommodation of traffic to and from the north *via* Larbert, to require the Scotch companies to run trains in conjunction, and trains between London and Perth and London and Aberdeen had long run under the statutory powers. In June last the English companies gave notice to the Scotch companies to alter the times of departure of three down trains from Edinburgh and one up train from Perth. The North British made no objection; but the proposed alterations were inconvenient to the Caledonian, and the difference referred to us was, whether that company was bound to comply with the notice from the English companies. As to two of the trains, the English companies had improved and accelerated their part of the joint service, and their object in doing so would have been defeated, and the service as a whole no better than before, if the times of the Scotch conjunction trains remained unaltered. These trains, therefore, we decided, must be altered to suit the alterations in the trains with which they were in connection. The two other trains were trains from London to Aberdeen, and as to them, there was no alteration in the times they left London or reached Edinburgh or Aberdeen; but there was a long stoppage at Edinburgh, and this stoppage it was desired to abridge, in order that the passengers might arrive earlier and have more time at Perth. This was not convenient to the Caledonian, for the reason that at Larbert these trains from Edinburgh met other trains from the west and south, and the whole were sent on together to Perth. A consideration, however, that outweighed this inconvenience, from a public point of view, as to one of the two trains, was, that passengers by that particular train were sometimes late for a train leaving Perth a quarter of an hour after the train in question was due there, and as to such train we held that the Caledonian must carry out the requisition of the English companies. With regard to the remaining or fourth train, we were of opinion that the duty of giving a fair connection did not, under the circumstances, oblige the Caledonian to alter the time at which the train had been previously running from Larbert to Perth.

26. In the East London *v.* London, Brighton & South Coast the Brighton worked under agreement the East London from Liverpool-street station to its junctions with their Brighton & South London at New-cross and Old Kent-road station, and the complaint of the East London was, that the Brighton did not make that use of the line for the accommodation of through passenger traffic for which, as a line in continuous communication with their railways, it was calculated, and which it was said was required by the terms of the agreement so to work the line as fairly and efficiently to develop the traffic. Passengers, for example, could not travel through without a change of carriage, nor by trains on one line which were in good and close connection with trains on the other, nor at as low a charge to Liverpool street as to London Bridge, and at New-cross Junction the station arrangements of the Brighton made it impossible to have an easy and rapid exchange of traffic. We considered these complaints to be well founded, and that the working agreement raised the duty of providing a better service than was being given for through traffic, and our decision indicated the several points which would require to be remedied. No absolute order has as yet been issued in this case, as it was represented to us by the complainants that the intimation of our views made in the decision would perhaps be sufficient without such order.

[TO BE CONTINUED.]



L. COES'

GENUINE IMPROVED PATENT

Screw Wrenches

MANUFACTURED BY

L. COES & CO.,

Worcester, Mass.

Establish'd in 1839.

Registered March 31, 1871.

We invite the particular attention of the trade to our New Straight Bar Wrench, *widened*, full size of the larger part of the so called Lindsay's "REINFORCED OR JOG BAR." Also our enlarged jaw, made with ribs on the inside having a full bearing on front of bar (see sectional view), making the jaw fully equal to *any* strain the bar may be subjected to.

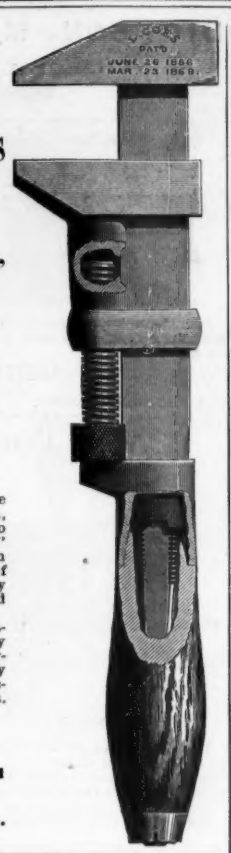
These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use) verifies our claim, that we are manufacturing the strongest Wrench in the market.

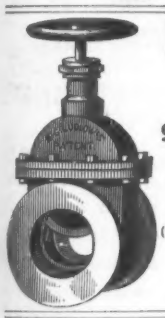
None genuine unless stamped

"L. COES & CO."

Warehouse, 97 Chambers and 81 Reade Streets, New York.

HORACE DURRIE & CO., Agents.





LUDLOW VALVE MFG. CO.,

OFFICE AND WORKS:

938 to 954 River St. and 67 to 83 Vail Ave., Troy, N.Y.

VALVES

(Double and Single Gate, ¾ in. to 48 in.—outside and inside Screws, Indicator, &c.) for Gas, Water and Steam. Send for Circular.

Also, FIRE HYDRANTS.

PEET VALVE COMPANY,

153 Hampden Street, Boston, Mass.,

MANUFACTURERS OF

Quick-opening Valves,

FOR

RAILROAD WATER TANKS;

Also Valves for Steam, Water, Gas, &c.

In use on the BOSTON & ALBANY; BOSTON, CLINTON & FITCHBURG; NEW YORK & NEW ENGLAND, and other roads.

CHERRY HEAT WELDING COMPOUND.

SCHIERLOH MANUFACTURING COMPANY,

Office, 24 Exchange Place, Jersey City, N. J.

OFFICE OF PURCHASING AGENT,
Lake Shore & Michigan Southern R'y.,
Cleveland, O., March 1, 1876.

IRON CLAD PAINT CO., Cleveland, O.

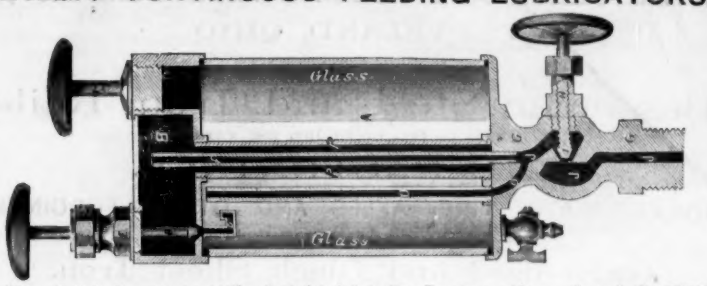
Gentlemen—Your "Metallic Paints," known as "*Iron Clad Paints*," have in the past nine years been extensively used and thoroughly tested by this Company as to their *covering capacity, durability and resistance to atmospheric changes*, latter "paint destroyer" the most difficult to overcome in outside paints. We have used over 100 tons and can emphatically accord them the highest position over any paint heretofore produced for Cars, Roofs, Stations, Bridges, &c. The monthly increase of our orders is the best evidence that your paint is constantly growing in favor with our mechanics.

Very respectfully yours,

A. C. ARMSTRONG

Gen'l. Purchasing Agent, L. S. & M. S. R'y. Co.

Parshall's CONTINUOUS FEEDING LUBRICATORS.



These Lubricators are especially adapted to lubricating Locomotives through the STEAM PIPE, and lubrication is directly under the control of the engineer. Lubrication always regular and constant. For particulars address

C. H. PARSHALL,
135 Alfred Street, DETROIT, Mich.

BRADLEY'S CUSHIONED HELVE HAMMERS

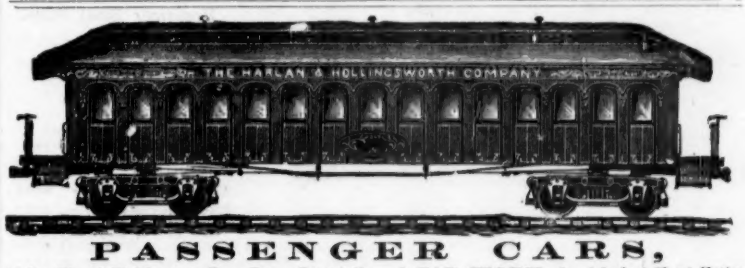
Has won golden opinions from the Mechanical World during the four years it has been before the public, and has reached a sale of 190 Hammers, all in successful operation, in this and foreign countries.

It Has More Good Points,
Less Complication,
More Adaptability,
Does More and Better Work, Larger Capacity,
Takes Less Power,
Costs Less for Repairs
than any Hammer in the World.

GUARANTEED AS REPRESENTED.

Western Office, 22 South Canal St., CHICAGO, ILL.
A. B. BARNES, Manager.

BRADLEY MANUFACTURING CO.,
[Established 1832.] SYRACUSE, N. Y.



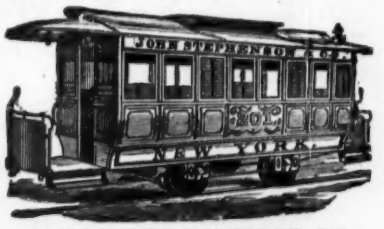
PASSENGER CARS,

Of the Finest Finish, as well as Every Description of CAR WORK, furnished at Short Notice and at Reasonable Prices by the

HARLAN & HOLLINGSWORTH COMPANY, Wilmington, Del.

Cars, Light, Strong and Elegant.

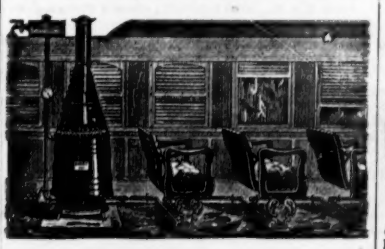
ORDERS PROMPTLY FILLED.



OMNIBUSES OF EVERY STYLE.

No. 47 EAST TWENTY-SEVENTH STREET, NEW YORK.

BAKER'S PATENT CAR WARMER.

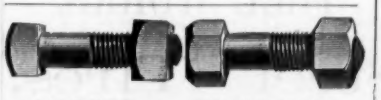


Hot Water Pipes at the Feet of Each Passenger.

Full Descriptive Pamphlets Furnished on Application.

BAKER, SMITH & CO.

Cor. Greene & Houston sts., NEW YORK. | 81 & 83 Jackson st. CHICAGO.



HOOPES & TOWNSEND,

MANUFACTURE

machine and Car Bolts, Wood Screws, Cold-Punched square and Hexagon Nuts, Washers, Keystone Boiler Rivets, Tank Rivets, Railroad Track Bolts, Chain Links, Car Irons, Bridge Bolts, Bridge Irons Rods and Bolts for Buildings, &c.,

No. 1330 Buttonwood st., Phila.

PHILADELPHIA CAR WORKS.

J. G. BRILL & CO.,

manufacturers of cars of every description. Street Cars of the most approved styles. Narrow Gauge. Passenger and Freight Cars.

Thirty-first and Chestnut Streets, PHILADELPHIA.

☞ Cars built in sections for shipment.

BLACK DIAMOND FILE WORKS

TRADE MARK.

G. & H. BARNETT.

Nos. 39, 41 & 43 Richmond Street, PHILADELPHIA.

SEND FOR CATALOGUE.

MANUAL OF THE

RAILROADS OF THE UNITED STATES.

(Ninth Series, 1876-77; Nine Hundred pages.)

Price Five Dollars. HENRY V. POOR, Editor.

The Ninth Series of this MANUAL was issued early in July. It is compiled entirely from official sources. The MANUAL has become the standard authority on all matters connected with American Railroads, and is indispensable for Bankers, Brokers, Financiers, Political Economists, and all persons interested in Railroads, either as Contractors, Investors, Dealers, or Holders of Securities.

Published and for sale by H. V. & H. W. POOR, 68 Broadway, New York City.

THE CLEVELAND ROLLING MILL COMPANY,

CLEVELAND, OHIO,

MANUFACTURERS OF

Bessemer Steel and Iron Rails,

From 35 lbs. to 70 lbs. per yard,

AND FASTENINGS,

BOILER PLATE, TIRE, AXLES AND OTHER FORGINGS,

Of Siemens-Martin and Bessemer Steel, and of Iron.

Galvanized and Black Sheet Iron.

CORRUGATED ROOFING AND SIDING.

SPRING STEEL AND WIRE OF ALL KINDS.

WIRE CLOTH.

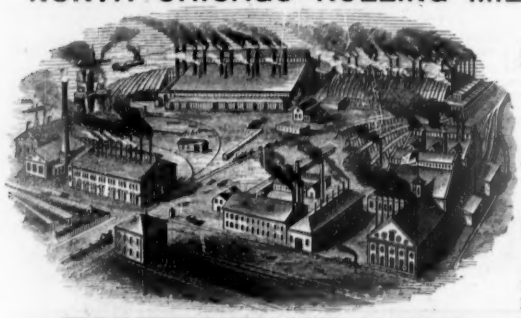
Agents fo the Sale of Steel Screws of all Sizes.

Using Lake Superior Iron Ore, from its own mines, and having a long experience in manufacturing, this company can warrant the quality of its products.

A. B. STONE, President, 20 Nassau st., New York.

H. CHISHOLM, Vice-Pres. and Gen. Manager, Cleveland, O.

NORTH CHICAGO ROLLING MILL COMPANY,



WORKS OF THE NORTH CHICAGO ROLLING MILL COMPANY.

MANUFACTURERS OF

PIG METAL, IRON RAILS,

AND

Bessemer Steel Rails.

OFFICE:

17 Metropolitan Block, CHICAGO.

O. W. POTTER, President.
S. CLEMENT, Treasurer.
R. C. HANNAH, Secretary.

Established - - 1857.
Incorporated - - 1869.
CAPITAL, $3,000,000.

The Company possesses facilities for the production of Iron and Steel Rails of BEST QUALITIES Any of the usual patterns of rails supplied on short notice. New patterns will be made to order. **Capacity of Works, 50,000 tons Iron and 50,000 tons Steel per annum.**

SPRINGFIELD IRON COMPANY
BROAD & NARROW GAUGE
RAILS
SPRINGFIELD, ILLINOIS.

Orders Solicited for Iron Rail

Of any Weight not Less than 30 lbs. per yd.

RE-ROLLING PROMPTLY DONE

On the Most Favorable Terms.

The Iron Rail Piles made by this Company are all heated with Siemens' Gas Furnace, thereby securing perfect welds.

CHARLES RIDGELY, President.
JOHN W. BUNN, Vice-President.
GEO. M. BRINKERHOFF, Sec'y.

Capacity of Works 3,000 Tons per Month.

THE ALBANY & RENSSELAER IRON & STEEL CO.

ERASTUS CORNING, Pres.; SELDEN E. MARVIN, Sec'y & Treas.; CHESTER GRISWOLD, V. Pt.; JAMES E. WALKER, Gen'l Manager.

TROY, N. Y.

NEW YORK OFFICE, 56 BROADWAY.

PROPRIETORS OF

The Albany Iron Works, The Rensselaer Iron Works, The Bessemer Steel Works, The Fort Edward Blast Furnace, The Columbia Blast Furnace.

Manufacturers of Bessemer Steel and Iron Rails, Fish-Plates, Bolts and Nuts for Fish-Joints, Railroad Frogs, Railroad, Boat and Ship Spikes. All sizes Merchant and Angle Iron, Merchant, Bar and Spring Steel, Bessemer Steel Shafting, Crow-Bars and Cut and Clinch Nails, Boiler Rivets, Finger Bars and Shapes, Railroad Car, Truck and Engine Axles.

WALKER'S PATENT IMPROVED HORSE-SHOES.

We refer with especial pleasure to the quality of the articles manufactured by us, and warrant the same equal to any other manufactures in the United States.

All orders addressed to us will receive prompt attention.

THE STANDARD STEEL WORKS.

Crucible Steel Tires,

STANDARD & BRAND.

Forgings, Axles, Castings.

Works at Lewistown, Pa. Office, 218 S. 4th St., Philadelphia, Pa.

THE CAMBRIA IRON WORKS,

Situated on the line of the Pennsylvania Railroad, at the western base of the Allegheny Mountains, are the largest of their class in the United States, and are now prepared to make **2,000 tons per week of Iron and Steel Railway Bars.**

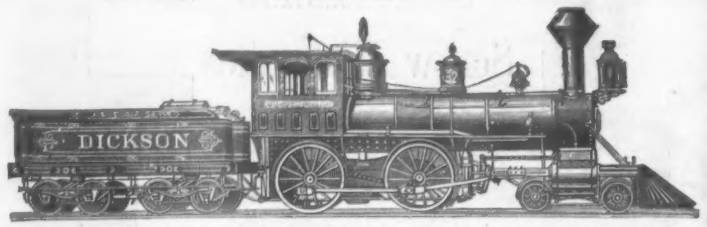
The Company possesses inexhaustible mines of Coal and Ore, of suitable varieties for the production of Iron and Steel Rails of BEST QUALITY.

Their location, coupled with every known improvement in machinery and process of manufacture, enables them to offer Rails, when quality is considered, at lowest market rates. Address

CAMBRIA IRON COMPANY, No. 218 South Fourth street, Philadelphia, or at the Works, Johnstown, Pa., or J. S. KENNEDY & CO., Selling Agents, No. 41 Cedar street, New York.

DICKSON MANUFACTURING COMPANY,

Scranton and Wilkesbarre, Pa.



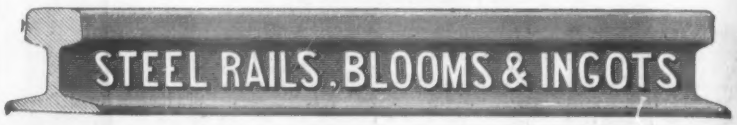
Manufacturers of Locomotives adapted to every kind of service. Pumping and Mining Machinery a specialty. Cars, Car Wheels, Forgings and Machinery of all kinds. Specifications promptly furnished on application.

GENERAL OFFICE, Scranton, Pa.

G. L. DICKSON, President. W. H. PERKINS, Treasurer. W. B. CULVER, Gen. Sup't.

THE EDGAR THOMSON STEEL CO., LIMITED,

MANUFACTURERS OF



General Office and Works at Bessemer Station (Penn. R.R.), Allegheny County, Pa.

New York Office, No. 57 Broadway.

The members of the Edgar Thomson Steel Company, Limited, have had large experience in manufacturing and in railway management; their works are the most complete in the world, with all the late improvements, and are located in the best Bessemer metal district in the United States, and their managing officers are experienced in the manufacture of Bessemer Steel.

The Company warrants its rails equal in quality to any manufactured in the United States.

Rails of any weight or section furnished on short notice. Orders for trial lots solicited.

Branch Office and P. O. Address, No. 41 Fifth Ave., Pittsburgh, Pa.

D. McCANDLESS, Chairman.

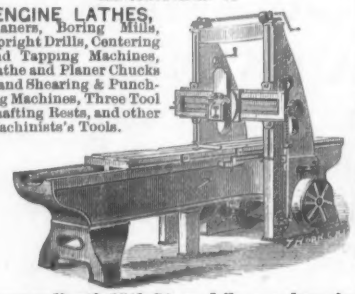
WM. P. SHINN, General Manager.

EDWIN HARRINGTON & SON,

MANUFACTURERS OF

ENGINE LATHES,

Planers, Boring Mills, Upright Drills, Centering and Tapping Machines, Lathe and Planer Chucks Hand Shearing & Punching Machines, Three Tool Shafting Rests, and other Machinists's Tools.



Corner North 15th St. and Pennsylvania Avenue, Philadelphia, Pa.

MORSE TWIST DRILL AND MACHINE COMPANY,

MANUFACTURERS OF

TAPS, DIES, SCREW PLATES, Etc.

These tools are furnished with V or U. S. standard shape of threads and any desired pitch or number of threads per inch. Having completed our special gauges and machinery for making the U. S. or Flat Top and Bottom of thread, we invite attention of R. R. men to our manufacture of long shank or nut taps, which we in all cases guarantee against imperfections such as fire cracks, temper or gauge.

For descriptive circular of Machinists', Blacksmith, Pipe and other taps, and screw plates, etc., send to

H. S. MANNING & CO.,

Sole agents for the sale of above tools,

111 LIBERTY STREET, NEW YORK.

PHOSPHOR BRONZE SMELTING WORKS.

C. J. A. DICK, Proprietor,

2038 WASHINGTON AVENUE, PHILADELPHIA, PA., Patentee and sole manufacturer of Phosphor Bronze in the United States.

REGISTERED TRADE MARKS:

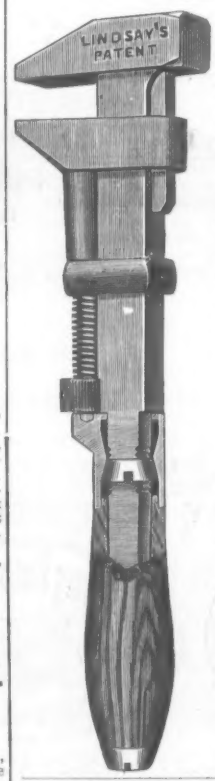
"Phosphor-Bronze."

Several principal railway corporations are using Phosphor Bronze bearings exclusively.

Particulars on application at the works, or to licensed founders: GEO. K. TRYON, Callowhill, west of Broad street, Philadelphia; ATWOOD & McCAFFREY, 50 to 60 Third avenue, Pittsburgh.

JOHN ROBBINS
MANUFACTURER OF
—CHECKS—
AND
BADGES
FOR RAILROADS, STEAMERS, HOTELS &C.
42 KNEELAND St. BOSTON MASS

THE CELEBRATED LINDSAY WRENCH.



The Lindsay Wrench was very favorably received by the Master Mechanics when first introduced.

We have added, the "Coes'" improvements to that of Lindsay, and claim to make now the strongest wrench known.

Manufactured under

John P. Lindsay's Patent, Dec. 12, 1865.

A. G. Coes' Patent, May 2, 1871.

A. G. Coes' Patent, Dec. 26, 1871.

F. L. Coes' Patent Aug. 1, 1876.

Manufactured expressly for Railroad use.

A. G. COES & CO., Worcester, Mass.

CAST STEEL WORKS

OF FRIED. KRUPP,

Essen, Rhenish Prussia.

TIRES, AXLES SPRING STEEL,

Crank Pins, Connecting Rods, Piston Rods, Boiler Plates, &c., &c.

Special Tool Steel,

A Very Superior Article, Suitable for All Kinds of Cutting Tools, Dies, &c.

Represented by

THOS. PROSSER & SON, 15 Gold street, New York.

DEAD-STROKE POWER HAMMERS.

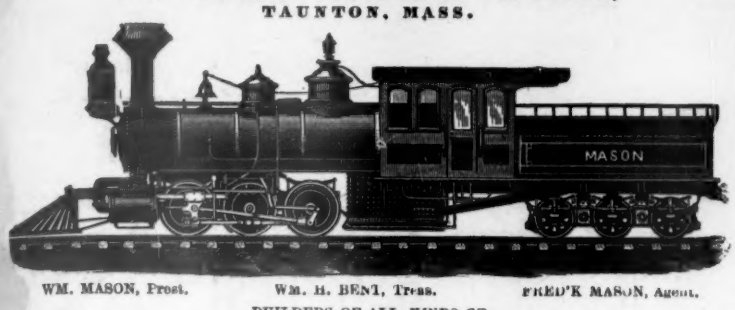
Improved Hydraulic Jacks,

Manufactured by

PHILIP S. JUSTICE,

PHILADELPHIA, PA.

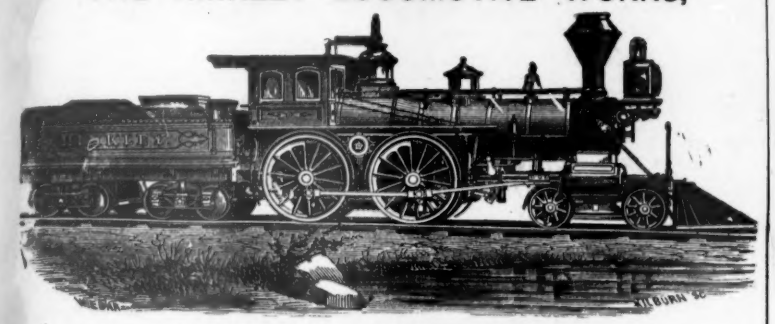
THE MASON MACHINE WORKS,
TAUNTON, MASS.



WM. MASON, Prest. WM. H. BENT, Treas. FRED'K MASON, Agent.

BUILDERS OF ALL KINDS OF
LOCOMOTIVES,
INCLUDING DOUBLE-TRUCK LOCOMOVIVES FOR WIDE OR NARROW-GAUGE RAILROADS
ALSO ALL KINDS OF COTTON MACHINERY

THE HINKLEY LOCOMOTIVE WORKS,



439 ALBANY STREET, BOSTON,
MANUFACTURE
Locomotive Engines and Tenders, Boilers and Tanks,
Gun Metal and Common Iron Castings, Brass and Composition Castings.

LOCOMOTIVES AND BOILERS REPAIRED.

☞ Sole manufacturers of the "HINKLEY PATENT BOILER." All orders will be executed with dispatch.

ADAMS AYER, Pres't. F. L. BULLARD, Treas. FRANK D. CHILD, Sup't.
GEO. F. CHILD, Secretary. H. L. LEACH, General Manager.

ROGERS LOCOMOTIVE AND MACHINE WORKS
Paterson, N. J.; New York Office, 44 Exchange Place.

MANUFACTURERS OF
Locomotive Engines and Tenders and Other Railroad Machinery.

J. S. ROGERS, President.
R. S. HUGHES, Secretary.
WM. S. HUDSON, Supt.
} PATERSON, N. J.

R. S. HUGHES, Treas.,
44 Exchange Place, New York.

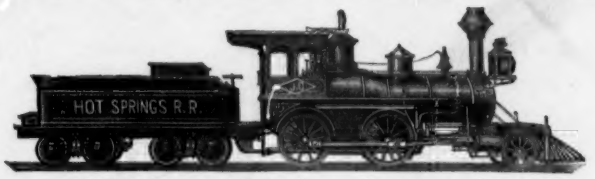
TAUNTON LOCOMOTIVE MANUFACTURING CO.,

P. I. PERRIN, Supt. [ESTABLISHED IN 1846.] HARRISON TWEED, Treas.
TAUNTON. MASS.

MANCHESTER LOCOMOTIVE WORKS,

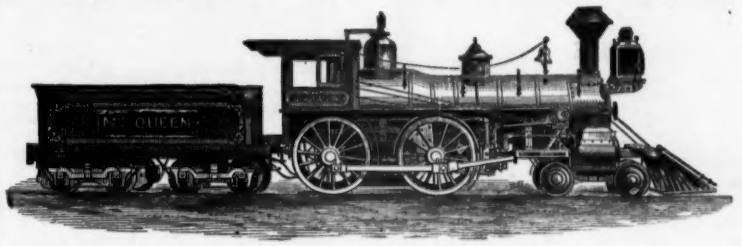
MANUFACTURERS OF LOCOMOTIVE ENGINES.
All work accurately fitted to gauges. All parts duplicated and guaranteed of best material and workmanship.
ARETAS BLOOD, Agent, Manchester, N. H. JOHN A. BURNHAM, President.
WM. G. MEANS, Treas., Boston, Mass

PORTER, BELL & CO., Pittsburgh, Pa.
Exclusive Specialty: Light Locomotives
For Narrow-Gauge Passenger and Freight, Street Railway, Mine, Shifting, and all kinds of Special Service.



All work built of best material to thorough system of standard templets and gauges.
OUR NEW CATALOGUE WILL BE MAILED ON APPLICATION.

SCHENECTADY LOCOMOTIVE WORKS,



SCHENECTADY, N. Y.
JOHN C. ELLIS, Pres. CHAS. G. ELLIS, Treas. JOHN SWIFT, Supt

BROOKS LOCOMOTIVE WORKS,
DUNKIRK, N. Y.

Orders Solicited for Locomotives Adapted for Every Class of Railway Service.
M. L. HINMAN, SEC'Y & TREAS. H. G. BROOKS, PRES'T & SUP'T.

DANFORTH LOCOMOTIVE AND MACHINE CO.

JOHN COOKE, President.
J. T. BLAUVELT, Vice-President.
WM. BERDAN, Sec'y & Treasurer.
JAMES COOKE, Superintendent.
} PATERSON, N. J.

New York Office, 52 Wall St
H. A. ALLEN, AGENT.

NATIONAL LOCOMOTIVE WORKS.

W. H. BAILY & CO.,
MANUFACTURERS of LOCOMOTIVES. LIGHT and NARROW-GAUGE LOCOMOTIVES A SPECIALTY
All Material and Workmanship Guaranteed to be of the Very Best.
OFFICE AND WORKS AT CONNELLSVILLE, PA.

PITTSBURGH LOCOMOTIVE & CAR WORKS,
PITTSBURGH, PA.

MANUFACTURERS OF
LOCOMOTIVE ENGINES FOR BROAD OR NARROW GAUGE ROADS,
From standard designs, or according to specifications, to suit purchasers.
Tanks, Locomotive or Stationary Boilers Furnished at Short Notice.
D. A. STEWART, *Pres't.* WILSON MILLER, *Sec. and Treas*

PATENT METALLIC SHEDS AND WAREHOUSES.

These Sheds are **LIGHT, STRONG,** AND **ELASTIC,** therefore especially well adapted to RESIST VIBRATIONS From Machinery and the pressure of heavy winds.

They can be taken apart and put up again in a very short time by any intelligent laborer, and also take little room for shipping by cars or steamers; they are consequently **PORTABLE** in the fullest sense of the word. Being built entirely of

Price List with Cuts furnished on application.

Non-Combustible Material.

they can not be ignited by sparks from locomotives, steamers, or neighboring fires, and in view of this fact they are very **ECONOMICAL,** as the small excess of the cost over a wooden structure is fully compensated by the REDUCTION IN THE **INSURANCE RATES** and the greater safety of the property stored.

Manufactured by

SCHWEIZER & GRUWE, 71 BROADWAY, N. Y.

THORNE, DeHAVEN & CO., Drilling Machines,

21st Street, above Market, Philadelphia.

PORTABLE DRILLS. Driven by power in any direction.
RADIAL DRILLS. Self-feed—Large Adjustable Box Table.
VERTICAL DRILLS. Self-feeding.
MULTIPLE DRILLS. 2 to 20 Spindles.
HORIZONTAL BORING AND DRILLING MACHINES.
HAND DRILLS. CAR BOX DRILLS.
SPECIAL DRILLS. For Special Work.

NEW YORK CENTRAL & HUDSON RIVER R. R.

THE ONLY 4-TRACK RAILROAD IN THE WORLD, ALL LAID WITH HEAVY STEEL RAILS.

This is the favorite route between the East and West, sixty miles the shortest, and eight to twelve hours the quickest between Boston and New England and the West.

Wagner Palace Sleeping and Drawing Room Cars Attached to All Trains.

Through cars New York and Boston to Buffalo, Niagara Falls, Cleveland, Toledo, Detroit, Chicago, Indianapolis, Louisville and St. Louis, &c. No extra charge via Niagara Falls.

New York Ticket Offices—252, 261, 413, 785 and 942 Broadway; 7 Park Place and Grand Central Depot.

C. B. MEEKER,
GENERAL PASSENGER AGENT.

ERIE RAILWAY.

BROAD GAUGE DOUBLE TRACK.

The Short Line Between New York and Buffalo and Niagara Falls.

THREE THROUGH EXPRESS TRAINS EACH WAY DAILY. LUXURIOUS DRAWINGROOM AND SLEEPING COACHES.

What Gives Popularity to a Railway.

1st. Good management; a strict regard to the comfort and safety of passengers.
2d. Low rates of fare, fostering and encouraging travel.
3d. Suitable equipment, with trains sufficient to accommodate all the business that offers.
4th. Regularity in the running of trains.
5th. Suitable eating houses at convenient points on the line.
6th. Variety and richness of scenery.

All these, and more which might be added, contribute to the well earned success and popularity of the ERIE RAILWAY.

E. S. BOWEN, General Superintendent. JNO. N. ABBOTT, General Passenger Agent.

THE ATLANTIC & GREAT WESTERN RAILROAD,

in connection with the

ERIE RAILWAY,

forms the Great Broad-Gauge Route to the WEST and SOUTH. **For Chicago, Cleveland, Omaha and all points in the Northwest. For Cincinnati, Louisville, St. Louis, Kansas City and points in the Southwest.**

THIS IS THE ONLY LINE, in connection with the Erie Railway, which runs through sleeping coaches from New York and local stations to Chicago, Cleveland, Mansfield, Galion, Dayton and Cincinnati without change.

Special The Southern system of railways are now running palace sleeping coaches from Cincinnati (in direct connection with express trains on this line) to Memphis, Jackson and New Orleans; from Cincinnati to Nashville, Decatur, Montgomery, Mobile and New Orleans—making but one change from New York to any prominent point South—via this line.

For through tickets at lowest rates, palace coach locations, and further information concerning the route, please apply at ticket offices Erie Railway and at offices of connecting lines.

Ask for tickets via the Atlantic and Great Western Railroad.

P. D. COOPER, Gen. Supt., CLEVELAND, O. W. B. SHATTUC, Gen. Passenger Agent, CINCINNATI, O.

NEW YORK AND NEW ENGLAND RAILROAD.

FOUR POPULAR LINES.

New and popular line between Boston and Philadelphia without change of cars, via N. Y. & N. E. H. P. & F., N. Y., N. H. & H. Railroads. Transfer steamer Maryland (between Harlem River and Jersey City). Two express trains, each way, each week day, between Boston and Philadelphia. Most direct route between Boston and Brooklyn.

Elegant drawing-room cars on all trains. Baggage checked through.

A. C. KENDALL, Gen. Pass. Agent. CHAS. P. CLARK, Gen. Manager.

ONLY DIRECT LINE TO FRANCE.

The General Transatlantic Company's Mail Steamers Between New York and Havre, Calling at Plymouth, (G. B.), for the landing of Passengers.

The splendid vessels of this favorite route for the Continent (being more southerly than any other) will sail from pier No. 43, North River, as follows:

LABRADOR (Santlier).....SATURDAY, Dec. 30, at 3 p. m.
AMERIQUE (Pouzolz).....SATURDAY, Jan. 13, 3 p. m.
FRANCE (Trudelle).....SATURDAY, Jan. 27, at 3 p. m.

PRICE OF PASSAGE IN GOLD (including wine): First cabin, $110 to $120, according to accommodation. Second cabin, $72. Third cabin, $40.

Return tickets at reduced rates.

Steerage, $26, with superior accommodation, including wine, bedding and utensils, without extra charge.

LOUIS DE BEBIAN, Agent, 55 Broadway.

PENNSYLVANIA RAILROAD.

GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.

Connecting **all the principal cities on the Atlantic Coast** with those in the **Mississippi Valley** and on the **Great Lakes. Through trains with Palace Cars attached, between New York, Philadelphia, Washington and Baltimore and Chicago, St. Louis, Cincinnati and Louisville.**

Baggage Checked to Destination. Fare always as low as by any other route.

For tickets, palace and parlor car accommodations, and all desired information, apply at the offices of the Company: Nos. 203 and 205 Washington st., **Boston;** No. 1 Astor House, Nos. 526 and 944 Broadway, and Desbrosses and Cortlandt street ferries, **New York;** Nos. 838 and 1348 Chestnut street, and Depot, Thirty-second and Market streets, **Philadelphia;** N. E. cor. Baltimore and Calvert streets, Union Depot and Northern Central Railway Depot **Baltimore;** N. E. corner Thirteenth street and Pennsylvania avenue, N. E. corner Sixth street and Pennsylvania avenue, and Baltimore and Potomac R. R. Depot, **Washington City.**

D. M. BOYD, Jr., General Passenger Agent.
FRANK THOMSON, General Manager.

NORTH PENNSYLVANIA RAILROAD.

THE SHORT AND FAVORITE ROUTE FROM PHILADELPHIA To the Lehigh, Wyoming and Susquehanna Valleys, Scranton, Elmira, Rochester, Buffalo, Niagara Falls New York State, the West and Northwest.

FAST TIME, SURE CONNECTIONS, PARLOR AND SLEEPING CARS.

Philadelphia Passenger Depot, Berks and American Streets.

FREIGHT FACILITIES:

Daily fast Freight Trains are run between Philadelphia and the above-named districts, delivering freight with regularity and dispatch on terms as low as any other route.

PHILADELPHIA FREIGHT DEPOT, FRONT AND NOBLE STREETS.

ELLIS CLARK, Gen'l Agent, Front and Willow Streets, Philadelphia.
Philadelphia City Offices: Fifth and Chestnut sts. and 732 Chestnut st.

THE BEST ROUTE TO INTERIOR PENNSYLVANIA.

Express Trains daily from Philadelphia to Reading, Harrisburg, Tamaqua Pottsville, Mahanoy City, Ashland, Shamokin, Danville, Williamsport, and all points on the Coal, Lumber and Ore Regions of the State.

EXPRESS TRAINS FROM ALLENTOWN FOR SAME POINTS IN CONNECTION WITH TRAINS OF CENTRAL RAILROAD OF NEW JERSEY FROM NEW YORK.

Purchase Tickets via Reading.

J. E. WOOTTEN, Gen. Supt., Reading. C. G HANCOCK, Gen. Ticket Agent, Phila.

CLEVELAND, COLUMBUS CINCINNATI & INDIANAPOLIS RAILWAY,

THE GREAT CENTRAL TRUNK ROUTE TO THE

OHIO AND MISSISSIPPI RIVERS.

Evening trains leave CLEVELAND daily with Rotunda Sleeping Cars, for COLUMBUS, CINCINNATI, INDIANAPOLIS, LOUISVILLE, TERRE HAUTE, EVANSVILLE, ST. LOUIS and all points West and South.

Morning trains leave daily except Sunday, with through Palace Coaches, for COLUMBUS, CINCINNATI, INDIANAPOLIS, LOUISVILLE and ST. LOUIS without change.

This is the only line making direct connection with all the Principal Trunk Lines of the East for NASHVILLE, MEMPHIS, NEW ORLEANS and all points in Texas, either by way of LOUISVILLE or ST. LOUIS.

Direct connection at ST. LOUIS for all Railway Towns in Kansas, Nebraska and Colorado.

EQUIPMENT COMPRISES ALL VALUABLE IMPROVEMENTS.

THE BEST ROAD-BED AND SAFEST ROAD IN THE WEST.

Tickets by this route for sale at all regular ticket offices.

E. S. FLINT, General Superintendent. S. F. PIERSON. General Ticket Agent.

UNION PACIFIC RAILROAD

VIA OMAHA.

THE ONLY DIRECT ALL RAIL ROUTE; being 226 miles the Shortest Route.

Salt Lake, Sacramento, San Francisco, and the Mining Districts of Utah, Montana, Nevada, California, Etc., Etc.

Five Hours the Quickest Route to Denver.

Close connections made at Cheyenne with Denver Pacific Railway. At Denver with the Colorado Central. At Golden City with Daily Coaches for the Mines. At Denver with Denver & Rio Grande Railway for all points in Southern Colorado, New Mexico and Arizona.

Baggage checked through from Chicago to Denver, and from Omaha to Salt Lake City, Sacramento, San Francisco, etc.

T. E. SICKELS, Chief Engineer and Superintendent. THOS. L. KIMBALL, General Ticket Agent, Omaha, Neb.

EMPIRE LINE.

THE EMPIRE TRANSPORTATION COMPANY OFFERS TO THE BUSINESS COMMUNITY A RELIABLE FAST FREIGHT LINE BETWEEN THE EAST AND THE WEST AND THE GREAT OIL REGION OF PENNSYLVANIA,

Via the Philadelphia & Erie Railroad and its Connections.

IT OWNS AND CONTROLS ALL THE CARS OF ITS LINE, which are new and built expressly for trade, and furnished with BROAD TREAD WHEELS, which enable it to run through irrespective change of gauge, thus avoiding the injurious delays prevalent at transhipping points.

The Line is managed by men of long experience in the business, and no effort will be spared on their part to render satisfaction to its patrons.

Parties ordering goods from the East will please direct shippers to mark packages "EMPIRE LINE, and refer them to the agents of the company for shipping directions, &c., &c.

GEO. W. RISTINE, Western Sup't, Cleveland, Ohio.
W. F. GRIFFITTS, Jr., General Freight Agent, Philadelphia, Pa.
GEORGE M. BALL, Eastern Superintendent, Philadelphia, Pa.

THE FAVORITE ROUTE---EAST OR WEST.

MICHIGAN CENTRAL RAILROAD,

AN IMPORTANT LINK IN THE

GREAT CENTRAL ROUTE

Between the East and West.

THREE EXPRESS TRAINS EACH WAY DAILY. THE ONLY LINE EAST FROM CHICAGO RUNNING THE CELEBRATED DINING CARS.

WAGNER SLEEPING AND PARLOR CARS.

THROUGH CARS FROM AND TO

CHICAGO, NEW YORK AND BOSTON.

H. B. LEDYARD, Gen'l Sup't, Detroit. HENRY C. WENTWORTH, Gen'l Pass. and Tkt. Agt., Chicago.

BALTIMORE & OHIO RAILROAD.

Three Fast Express Trains leave New York via Desbrosses and Cortlandt street ferries:

8:35 a. m., daily, except Sundays, Washington, Richmond and the South, Pittsburgh, Chicago, the West and Northwest, Louisville, New Orleans, &c.

8:55 p. m., Daily, except Sundays, Washington, New Orleans and the South, via Va. Midland, Cincinnati, Louisville, St. Louis, Chicago, the West and Northwest.

8:55 p. m., Daily, Washington, Richmond, and the South, Lynchburg, Danville and the Southwest, New Orleans, through sleepers Baltimore to New Orleans, Pittsburgh, Cincinnati Louisville, Indianapolis, St. Louis, Chicago, the West and Northwest.

For through Tickets and general information call at Company's offices, 261 and 315 Broadway, and at ticket offices foot of Desbrosses and Cortlandt streets. Ask for tickets via Baltimore & Ohio Railroad. Through cars, Jersey City to Washington. Through cars, Baltimore to Chicago, Cincinnati, &c.

PHILADELPHIA, WILMINGTON & BALTIMORE RAILROAD.

The connecting link between the EAST, WEST, NORTH, SOUTH, the centre of the GREAT THROUGH LINE between the cities of **NEW YORK, PHILADELPHIA, BALTIMORE** and **WASHINGTON**, the only route between the EAST, WEST and SOUTHWEST, via WASHINGTON, D. C., and the shortest and only direct route between the NORTH and SOUTH.

In every respect a first-class Railway. Tickets via BALTIMORE for sale in all principal ticket offices throughout the country.

H. F. KENNEY, Superintendent. General Offices at Philadelphia, Pa.

GEO. A. DADMUN, General Ticket Agent.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

THE DIRECT ROUTE TO

MILWAUKEE, ST. PAUL AND MINNEAPOLIS,

And all portions of Wisconsin, Minnesota and Northern Iowa.

Purchase Tickets Via Milwaukee.

Passengers going via this NEW DIRECT ROUTE to Milwaukee leaves from and arrive at the most Central and best located Depots in Chicago, Milwaukee and St. Paul.

BAGGAGE CHECKED THROUGH BY THIS ROUTE!

Passengers from Chicago can obtain these Advantages only by taking the trains of Chicago, Milwaukee & St. Paul Railway, at Union Depot, corner West Madison and Canal streets.

SPECIAL NOTICE.

This Line connects more important Business Centres than any other route in the Northwest, is as short as the shortest, and is fully equipped with the best of Day and Sleeping Coaches.

A. V. H. CARPENTER, Gen. Passenger Agent, Milwaukee.

S. S. MERRILL, Gen. Manager, Milwaukee.

T. E. CHANDLER, Passenger and Ticket Agent, 37 West Madison street, Chicago.

CHICAGO & NORTHWESTERN RAILWAY.

This great corporation now owns and operates over two thousand miles of road radiating from Chicago like the fingers of a man's hand, its lines reach in all directions and cover about all of the country north, northwest and west of Chicago. With one branch it reaches Racine, Kenosha, **Milwaukee** and the country north thereof; with another line it pushes through Janesville, Watertown, Oshkosh, Fond du Lac, **Green Bay,** Escanaba to Negaunee and **Marquette;** with another line it passes through Madison, Elroy and for **St. Paul** and **Minneapolis;** branching westward from Elroy it runs to and through **Winona, Owatonna,** St. Peter, **Mankato,** New Ulm, and stops not until Lake Kampeska, Dakota, is reached; another line starts from Chicago and runs through Elgin and Rockford to **Freeport,** and, via the Illinois Central, reaches Warren, Galena and **Dubuque;** and the country beyond. Still another line runs almost due westward, and passes through **Dixon,** Sterling, Fulton, Clinton (Iowa), **Cedar Rapids,** Marshalltown, Grand Junction, Missouri Valley Junction, to **Council Bluffs** and **Omaha.** This last-named is the "Great Trans-Continental Route," and the *pioneer overland line* for **Nebraska, Colorado, Utah, Idado, Montana, Nevada, California** and the Pacific Coast. It runs through the Garden of Illinois and Iowa, and is the best, safest, shortest and quickest route for **Omaha, Lincoln** and other points in Nebraska, and for **Cheyenne, Denver, Salt Lake City, Virginia City, Carson, Sacramento, San Francisco,** and all other points west of the Missouri River.

On the arrival of the trains from East or South, the trains of the **Chicago & Northwestern** Railway leave CHICAGO as follows

For **Council Bluffs, Omaha** and **California**—Two through trains daily, with Pullman Palace Drawing-Room and Sleeping Cars through to Council Bluffs.

For **St. Paul** and **Minneapolis**—Two through trains daily, with Pullman Palace Drawing Room Sleeping Cars attached, for St. Paul and through to Minneapolis.

For **Green Bay** and **Lake Superior**—Two trains daily, with Pullman Palace Cars attached.

For **Milwaukee**—Four through trains daily. Pullman Cars on night trains. Pulman parlor chair cars on day trains.

For **La Crosse, Wis., Winona and points in Minnesota**—One through train daily, with Pullman sleepers to Winona.

For **Dubuque** via **Freeport**—Two through trains daily, with Pullman Cars on night train.

For **Dubuque** and **La Crosse** via. Clinton—Two through trains daily, with Pullman cars on night train to McGregor, Iowa.

For **Sioux City** and **Yankton**—Two trains daily. Pullman cars to Missouri Valley Junction.

For **Lake Geneva**—Four trains daily.

For Rockford, Sterling, Kenosha, Janesville and other points you can have from two to ten trains daily.

MARVIN HUGHITT, General Manager. L. F. BOOTH, Gen. Ea. Ag., 415 Broadway, N. Y. city. W. H. STENNETT, General Passenger Agent.

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.

The direct route for Joliet, Morris, Ottawa, LaSalle, Peru, Henry, Peoria, Lacon, Geneseo, Moline,

ROCK ISLAND, DAVENPORT,

Muscatine, Washington, Iowa City, Grinnell, Newtown, Des Moines,

COUNCIL BLUFFS AND OMAHA,

Connecting with Trains on the Union Pacific Railroad for CHEYENNE, DENVER, CENTRAL CITY OGDEN, SALT LAKE, WHITE PINE, HELENA, SACRAMENTO, SAN FRANCISCO, and Points in Upper and Lower California, and with Ocean Steamers at San Francisco, for all points to

China, Japan, Sandwich Islands, Oregon and Alaska,

DEPOT, HEAD OF LA SALLE STREET; TICKET OFFICE, 56 CLARK STREET.

	LEAVE.	ARRIVE.
OMAHA AND LEAVENWORTH EXPRESS (Sundays excepted)	10.15 A. M.	4.00 P. M.
PERU ACCOMMODATION (Sundays excepted)	5.00 P. M.	9.35 A. M.
OMAHA AND LEAVENWORTH EXPRESS (Saturdays excepted)	10.00 P. M.	6.50 A. M.

KANSAS LINE.

The Chicago, Rock Island and Pacific Railroad Company have now opened their South Western Division, between

LEAVENWORTH, ATCHISON AND CHICAGO.

CONNECTING WITH KANSAS RAILROADS,

For all points in Western Missouri, Colorado and the Territories.

The Company have built a full complement of PALACE DRAWING ROOM AND SLEEPING CARS, which for external beauty and interior arrangements for the comfort, convenience and luxury of passengers are unexcelled, if equaled, by any other cars of the kind in the world.

☞ **For Through Tickets** and all desired information in regard to Rates, Routes, etc., apply at the Company's Offices, Chicago, or 957 Broadway, New York.

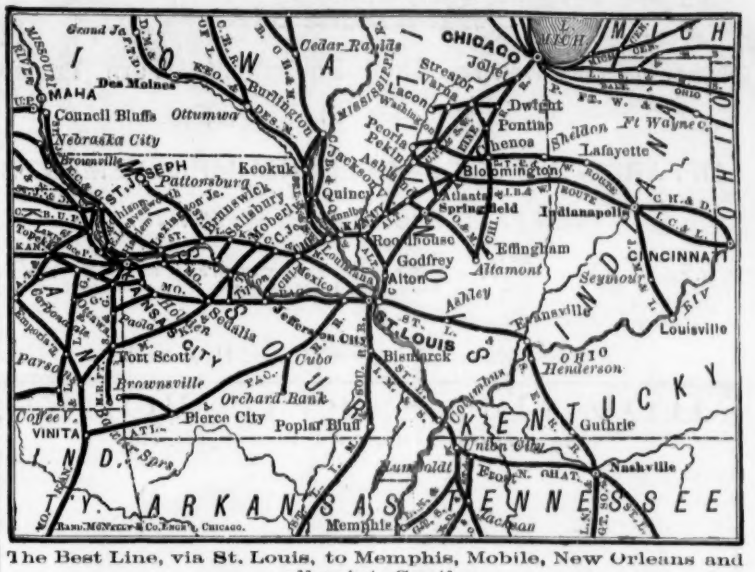
HUGH RIDDLE, Gen. Supt. **A. M. SMITH, Gen Pass. Agent.**

CHICAGO, ALTON & ST. LOUIS

AND

CHICAGO, KANSAS CITY & DENVER

SHORT LINES.



The Best Line, via St. Louis, to Memphis, Mobile, New Orleans and all points South.

THE SHORT LINE TO TEXAS, VIA ST. LOUIS.

No change of cars on any train by this line between Chicago and St. Louis. Pullman Palace Sleeping Cars—the newest, safest and best in use on any road—run through between Chicago and Springfield and Chicago and St. Louis without change. ***Meals in Dining Cars only 75 cents.*** No change of Reclining Chair Cars and Pullman Palace Sleeping Cars between Chicago and Kansas City. No extra charge for seats in Reclining Chair Cars. Two hours the quickest route from Chicago to KANSAS CITY, DENVER, PUEBLO and all points in Kansas and Colorado. No change of cars between Chicago and Peoria.

JAMES CHARLTON, General Passenger and Ticket Agent, Chicago.

J. C. McMULLIN, General Superintendent, Chicago.

ILLINOIS CENTRAL RAILROAD.

Trains Leave Chicago from the Great Central Depot, of Lake Street,

CHICAGO AND ST. LOUIS THROUGH LINE.

No Change of Cars to St Louis!

8.40 A. M. **DAY EXPRESS.** Sundays Excepted. Arriving St. Louis at 8.45 P. M.

8.30 P. M. **FAST LINE.** DAILY. Arriving at St. Louis at 8.30 A. M.

CAIRO, MEMPHIS, MOBILE AND NEW ORLEANS LINE.

No Change of Cars to New Orleans!

8.40 A. M. **DAY EXPRESS,** Sundays excepted, arriving at Cairo 2.20 A. M.; Memphis, 5.15 P. M.; Vicksburg, 10.10 A. M.; Mobile, 8.00 A. M.; and New Orleans at 11.45 A. M.

8.30 P. M. **NIGHT EXPRESS.** DAILY, tions for Arkansas and Texas.

4.30 P. M. **GILMAN PASSENGER.** Sundays Excepted. Arriving at Gilman at 8.50 P. M.

Arriving at Cairo 1.45 P. M., making direct connections

This Route is from 100 to 175 MILES SHORTER and from 12 to 24 HOURS QUICKER than any other.

PEORIA, BURLINGTON AND KEOKUK LINE.

8.40 A. M. EXPRESS. Sundays excepted. Arriving at El Paso 2.50 P. M.; Peoria 3.50 P. M. Through coach from Chicago to Peoria

8.30 P. M. EXPRESS. Sundays excepted. Arriving at Peoria 3.10 A. M.; Burlington 7.45 A. M. Keokuk 8.15 A. M.; Hannibal 11.30 A. M. Sleeping cars from Chicago to Peoria and Chicago to Hannibal.

CLINTON AND SPRINGFIELD LINE.

8.40 A. M. DAY EXPRESS. Sundays Excepted. Arriving at Gibson 1.57 P. M.; Farmer City 2.57 P. M.; Clinton 3.48 P. M.; Springfield at 6.05 P. M.

8.30 P. M. NIGHT EXPRESS. Sundays excepted. Arriving at Gibson 12.30 A. M.; Farmer City 1.55 A. M.; Clinton, 2.38 A. M.; Springfield, 4.35 A. M.

DUBUQUE AND SIOUX CITY LINE.

9.30 A. M. DAY EXPRESS. Sundays Excepted. Arriving at Dubuque 7.00 P. M.; Waterloo, 12.0? A. M.; Fort Dodge, 5.35 A. M.; Sioux City, 12.32 P. M.

9.30 P. M. NIGHT EXPRESS. Sundays Excepted. Arriving at Dubuque 6.55 A. M.; Waterloo 12.05 P. M.; Fort Dodge, 7.00 P. M.; Sioux City, 7.10 A. M.

This is the only Route to Dubuque and Sioux City without Change.

For Tickets, Sleeping Car Berths and information, apply at the Illinois Central Railroad Ticket Office 121 Randolph street, near Clark, and at the Central Depot, foot of Lake street.

W. P. JOHNSON, Gen. Pass. Agt. J. F. TUCKER, Gen. Supt.

ILLINOIS CENTRAL FREIGHT DEPARTMENT.

Freight taken for St. Louis, and points West and Southwest. For Hannibal and all points on the M. K. & T. R. R. For all landings on the Mississippi, Red and White Rivers, via Cairo and regular packets. The ONLY RAIL LINE TO MEMPHIS AND NEW ORLEANS, with

CARS RUN THROUGH WITHOUT CHANGE,

via the N. O., St. L. & C. R. R. and, by its connection at Frost, Tenn., the Direct Route to all points reached by the Green Line of the South; to Mobile, and points on the M. & O. R., via Jackson, Tenn., to Dixon, Freeport, Warren, Galena, Dunleith, and all landings on the Upper Mississippi during season of navigation, and without change of cars to Dubuque, Waterloo, Fort Dodge and Sioux City, Iowa; Vermillion and Yankton, Dakota Territory; and via Missouri Packets to points on the Upper Missouri.

Bills Lading and Rates furnished upon application at 121 RANDOLPH street, or foot of South Water street.

HORACE TUCKER, General Freight Agent.

WISCONSIN CENTRAL RAILROAD.

GARDNER COLBY, Pres., Boston, Mass. E. H. ABBOTT, Treas., Boston,

Built and operated by Phillips & Colby Construction Company. E. B. Phillips, Pres. and Gen. Manager Milwaukee; Charles L. Colby, Vice-Pres. and Land Commissioner, Milwaukee; E. Bacon, Superintendent, Milwaukee; Henry Pratt, Auditor and Gen. Ticket Agent, Milwaukee.

OFFICES: Milwaukee, Wis., and 28 State Street, Boston, Mass.

SHORT LINE TO GREEN BAY, the WISCONSIN and CHIPPEWA PINERIES, ASHLAND and BAYFIELD, LAKE SUPERIOR, Via MENASHA and STEVENS POINT.

TWO DAILY TRAINS FROM MILWAUKEE FOR MENASHA AND GREEN BAY.

ONE TRAIN FOR STEVENS POINT, WAUPACA, AMHERST, GRAND RAPIDS, PLOVER, PLAIN FIELD, COLBY, MEDFORD, PHILLIPS, FIFIELD AND ASHLAND.

Through Sleeping Cars on 9:30 p. m. train from Chicago (C., M. & St. Paul Depot), and from Milwaukee on 1:30 a. m. train for Green Bay, Menasha and Stevens Point. Sleeping car at Milwaukee ready at 8:30 p. m.

ELEGANT NEW CARS HAVE BEEN ADDED. Price of berth only $1 50.

CONNECTIONS: At Milwaukee, with Chicago, Milwaukee & St. Paul, and Western Union Railways; at Plymouth, with Sheboygan & Fond du Lac Railroad, for Fond du Lac and Sheboygan; at *Forest Junction*, with Milwaukee, Lake Shore & Western Railway; at Green Bay, with Green Bay & Minnesota Railway, for New London, and Chicago & Northwestern Railway, for points North; at Dale, with fast stage line for New London; at Ambert Junction, with Green Bay & Minnesota Railway, for Grand Rapids and points West; at Junction City, with Wisconsin Valley Railway, for Wausau; at Portage with C., Mil. & St. Paul Ry., for Madison and the West.

ESTABLISHED 1848.

WILLIAM SELLERS & CO.

PHILADELPHIA.

Machine and Railway Shop Equipments, Turn Tables, Pivot Bridges, Shafting, Etc.

GIFFARD'S INJECTOR--SELLERS' IMPROVEMENTS.

NEW PATTERNS, SIMPLE, EFFECTIVE.

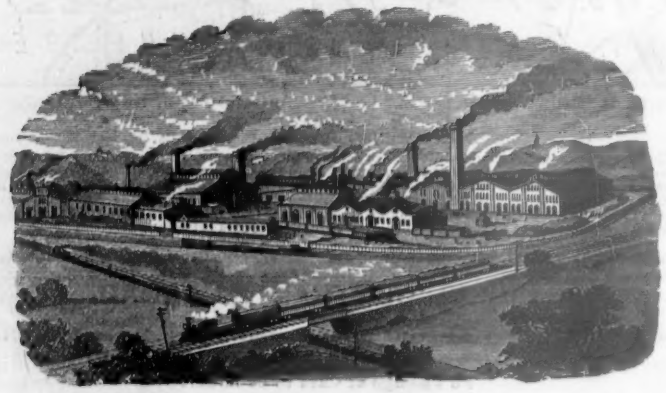
No. 2, 10 H. P., $18.	No. 3, 25 H. P., $25.	No. 4, 45 H. P., $35.	No. 5, 70 H. P., $45.	No. 6, 100 H. P. $55.	No. 7, 140 H. P., $65.	No. 8, 190 H. P., $75.	No. 10, 275 H. P. $95.

Send for circular giving particulars.

Branch Office, 79 Liberty Street, New York.

MIDVALE STEEL WORKS.

Works and Office, NICETOWN, Philadelphia, Pa.



MANUFACTURERS OF

Crucible and Open Hearth Steel,

Steel Locomotive Tires, Steel Axles of Every Description, Steel Forgings, up to 8,000 lbs. in Weight, Solid Steel Castings, Hammer Dies, Frogs, &c. Best Tool, Machinery and Spring Steels.

WM. SELLERS, Pres. MARRIOTT C. SMYTH. Sec'y and Treas. CHAS. A. BRINLEY, Sup't.

NATIONAL TUBE WORKS COMPANY,

SOLE MANUFACTURERS OF

MACK'S PATENT INJECTORS,

WITH ALL LATEST IMPROVEMENTS

NOW BEING USED BY SEVERAL LEADING RAILROADS

ON THEIR FASTEST TRAINS,

Without the Use of the Pumps.

OFFICES:

BOSTON—No. 8 Pemberton Square. CHICAGO—Nos. 112, 114 and 116 Lake Street.
NEW YORK—No. 78 William Street. CINCINNATI—Nos. 119, 121 and 123 Pearl Street.
McKEESPORT, Pa., near Pittsburgh.

TUDOR IRON WORKS,

St. Louis, Mo., and 36 Dearborn St., Chicago, Ill.

SPIKES, FISHBARS AND BOLTS.

JAMES PRENTICE,

164 Broadway, New York,

Manufacturer of Transits, Surveyors' Levels, and Compasses, Land Chains, Station Staffs, &c., &c.

A large assortment on hand warranted for quality and at reasonable prices.

VALENTINE & COMPANY,

VALENTINES VARNISH

333 PEARL STREET, NEW YORK.

HELLER & BRIGHTLY, Engineering and Surveying Instruments, 33 N. Seventh St., Phila.

Without decreasing size of any part of our "Engineers' Transit" we have reduced the weight one-half. An ordinary Transit Telescope magnifies from 10 to 12 diameters, our new Transit Telescope (length 10¾ inches, shows objects erect and not inverted) magnifies 28 diameters and will read time on a watch-dial at 983 feet. For description of our new Mining Transit (weight 5⅛ lbs.) and Plummet Lamp, see Van Nostrand's Engineering Magazine, June, 1873.

Extract from report of Committee of Civ. Engs. appointed by Franklin Inst. to examine H. & B.'s new Transit [Dec., 1871]: "It exhibits several novelties of construction which, in the opinion of the committee, render it superior to those now in use, and in its opinion the deviations which they have made from the common styles of Transit are decided improvements."

JOHN C. TRAUTWINE, Chairman.

Descriptive and Illustrated Price List sent Post-paid on Application.

ESTABLISHED 1820.

PATENT TRANSITS.

W. J. YOUNG & SONS,

Engineering Instrument Makers,

43 NORTH SEVENTH STREET,

Philadelphia.

Tapes, Chains, Draughting Instruments. Catalogues on application.

RICHARD DUDGEON.

24 COLUMBIA ST., NEW YORK,

MAKER AND PATENTEE OF IMPROVED

HYDRAULIC JACKS.

Punches, Roller - Tube Expanders, & Direct-Acting STEAM HAMMERS

Communications by letter will receive prompt attention.

JACKS FOR PRESSING ON CAR-WHEELS OR CRANK PINS MADE TO ORDER.

Elliot's Patent STEEL Rail Frogs AND Crossings.

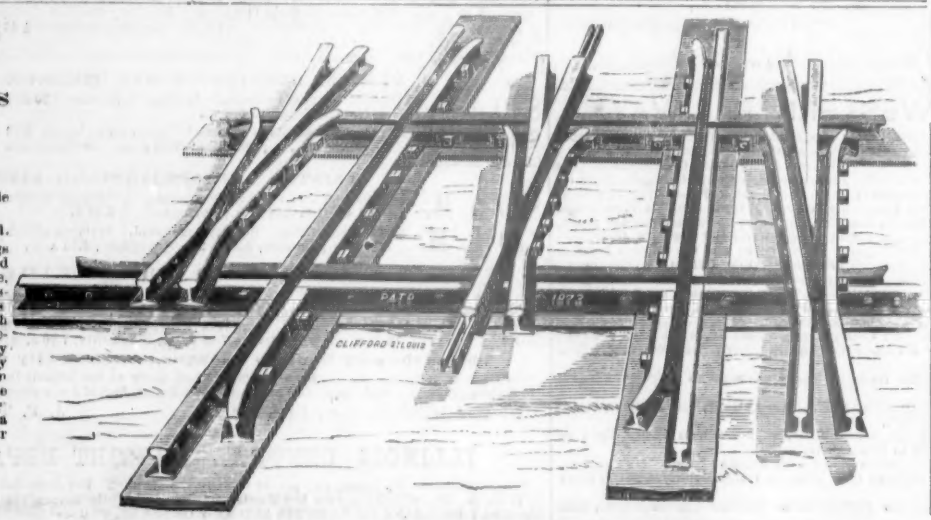
Frogs and Crossings made any angle desired.

Rail from 30 to 62 lbs. per yd.

These Frogs and Crossings are made of steel, combined with a wrought-iron frame, and bound together transversely with strong bolts which gives it great strength and durability without destroying its elasticity. They are connected at all ends by Fish Plate Joints, and lie on the same tie surface as the running rails without any cutting of ties, thus saving a great deal of time and labor in putting in place in track.

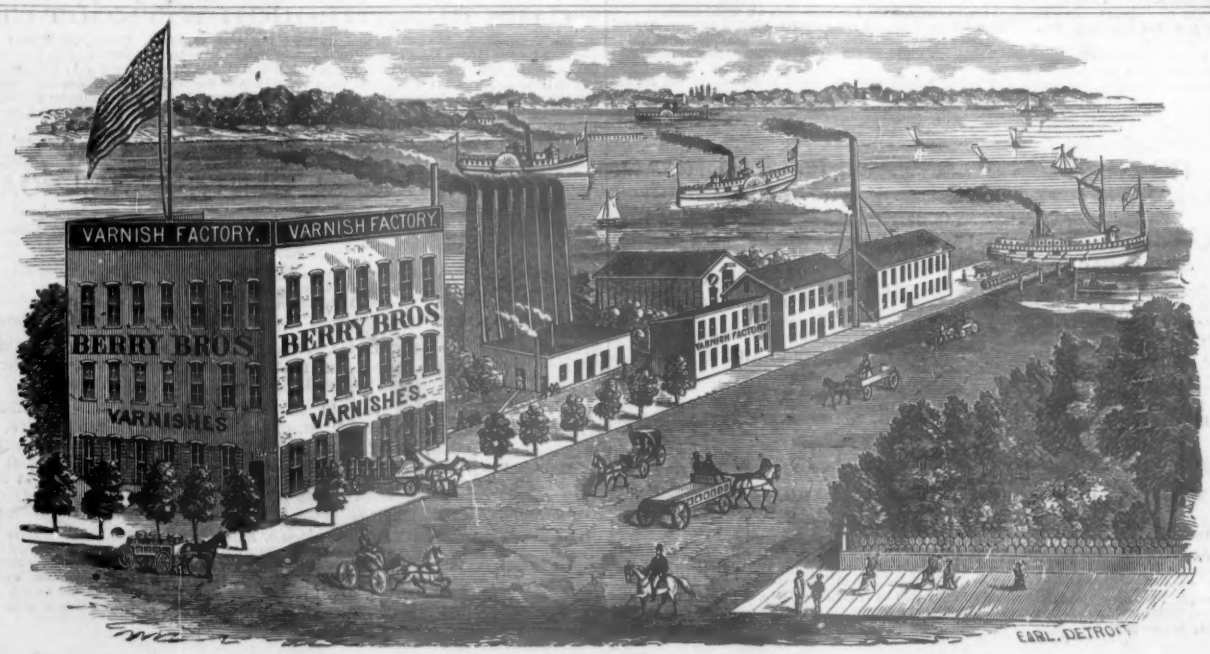
Manufactured by

H. & H. ELLIOTT,
East St. Louis, Il



BERRY BROTHERS, DETROIT, MICH.,

ESTABLISHED 1858,



MANUFACTURERS OF

RAILWAY VARNISHES.